NEW COLUMN! HIGH-PERFORMANCE ELECTRICS REVEALED page 100

MODEL Airplane NEWS

OCTOBER 2003

EXCLUSIVE 1ST LOOK

BIGGEST ARF EVER!

HANGAR 9's 100-INCH AEROBAT

page 34

FLY SMARTER!

Airtronics' new computer radios reviewed

46% Ultimate

EXPERTC ADVICE

- Gas engine installation
- Perfect panel lines
- Easy repair techniques

WE TEST FLY

> Projeti—Hobby *Lobby's hot wing*

> Extreme 3D-Carl *Goldberg's fun-fly ARF*

- Lancair-Greaf Planes' *sleek prebuilt*

> EPP Bee- *Wind rider's foam glider*

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MODEL Airplane NEWS

OCTOBER 2003, VOLUME 132, NUMBER 10

ON THE COVER: with its smoke system activated, the 46% Ultimate 10-300 leaves a white, fluffy signature during a flyby (photo by Pete Hall). ON THIS PAGE: Windrider Aviation's EPP Bee slope sailplane, reviewed by Dave Garwood on page 60 (photo by Dave Garwood).

FLIGHT TESTS

EXCLUSIVE! FIRST LOOK!

FEATURES

CONSTRUCTION

COLUMNS

DEPARTMENTS

The Ultimate ARF

Just how big is a 46-percent-scale ARF model plane? We learned firsthand when the Hangar 9 Ultimate TOC 10-300 ARF arrived by truck at our office in Ridgefield, CT. We unpacked this 100-inch-span wonder in the lobby, and within minutes of its arrival, the entire Air Age staff crowded around to take a look. No one could believe that such a gigantic plane could arrive completely built and covered; this model definitely qualifies as the biggest ARF ever!

(Left to right) Rick Bell, Gerry Yarrish and Sal Manganaro pose with the Hangar 9 46% TOC Ultimate 10-300. See page 34 for this exclusive flight test!

Because presstime was looming, senior technical editor Gerry Yarrish rounded up the needed gear and hardware, and then helped master builder Sal Manganaro with the prep work. Gerry also penned the review using Sal's notes and his own observations. But nothing worthwhile is ever easy, and even though the Ultimate was flight-ready in less than two weeks, rain and clouds canceled our first two airborne tests and photography sessions. As our deadline got closer and closer, we all bit our fingernails down to the quick and were checking the weather forecast 10 times a day. The third time was a charm, though; the sun broke through the clouds, the Ultimate got airborne and flew even better than we had anticipated. Associate editor Rick Bell shared stick time with Sal, and we all let out a collective sigh of relief after those first, entirely successful flights. If you can't already tell, we're very excited to showcase and review Hangar 9's newest flagship ARF on page 34. And you won't want to miss the video click trip on our Web page: modelairplanenews.com.

IN THE WORKSHOP

This issue features a triple-header of how-to's! First in the lineup, Gerry Yarrish details how he installed a Fuji 50cc in his Great Planes Pitts Special. Adding a gas powerplant to your next plane will be simple with these step-by-step photos and instructions.

Scale modelers will appreciate Charlee Smith's technique for creating great-looking metal panels. Charlee's guest "Scale Techniques" column starts on page 110.

And last, but not least, Steve Woodrough shares how he fixed his broken profile fuselage to make it as strong—and nearly as light—as it had been before it crashed. You can use Steve's method on any flat surface; check it out on page 84.

POWERLINES

The popularity of battery power isn't limited to small backyard flyers and indoor models; even giant-scale aerobats are taking advantage of this clean, quiet energy source. Fans of big, electric-powered planes won't want to miss our premier "Powerlines" column, authored by electrics expert Greg Gimlick. This bimonthly column will focus on .40-size and larger glow-to-electric conversions, multi-motor setups, high-power batteries and charging systems and more. If it's big, fast and electric, you'll read about it here.

We always appreciate hearing from you, whether it's a suggestion for an article, a comment on a past issue, a question for "Airwaves," or a photo for "Pilot Projects." We're also still looking for your favorite columns, articles, or memories associated with *Model Airplane News* for our 75th anniversary celebration, so please take a moment to share your thoughts with us. Send your email to man@airage.com, or write to us at 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Safe landings!

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FOUNDED 1929

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

FAN MAIL

I just wanted to let you know that *Model Airplane News* continues to be the magazine that I enjoy the most. Its recent articles for newcomers are great and are really needed—not just for newbies, but for all of the older guys in this hobby as well. The ARF coverage is right on the money, and it's exciting to see so many new ARFs that are of such outstanding quality. The color photos are great, too. I really enjoy getting your magazine in the mail each month; I can't wait to see all the good stuff you print! Keep up your efforts; they are greatly appreciated. Brian [email]

Thanks for making our day, Brian! We have a great time putting the magazine out and always enjoy hearing from readers that our efforts are appreciated. DC

TAKE CONTROL

I was very pleased to read the article "Program Like a Pro" in your September 2003 issue. I have been into RC for 20 years and have never bought a computer radio because I thought it would be too expensive and too complicated to learn. But several new computer radios are

now on the market and they have very attractive prices; I will seriously consider one for my next radio purchase. Can you suggest a book or other articles that go deeper into the subject of computer radios? I would like to build and fly more complicated models, and this would be a great place to start. Thanks for your help!

Thomas Severance, San Francisco, CA

Thomas, I'm glad that you enjoyed the article. We will look into publishing more in-depth articles on computer radios and programming but in the meantime, check out the "Ultimate RC Flight Guide" (available from rcstore.com). The book covers all aspects of flight and includes a chapter on radio programming. Good luck! GY

PROPELLER PUZZLE

I read with interest your contribution about propellers in the September, 2003 issue of Model Airplane News. I always learn something. There is one point, however, that I disagree with: your drilling pattern for bolt holes shown in Figure 5 of that article. I believe that the opposite of your "safer" pattern is true. The inherent strength of a piece of wood depends on the unbroken continuation of its grain from end to end. The more breaks in that grain, the weaker the wood

will be. The total amount of grain cut through in your recommended drilling pattern is 60 percent, whereas in the "not recommended" pattern it amounts to only 40 percent. Do you have any empirical observations that make you believe that your recommendation is valid? On a purely scientific basis, the opposite would appear to be true.

Gerry Rosebery [email]

Gerry, thanks for your thoughts on the topic. I haven't ever witnessed a model prop break because of the bolt-hole pattern. I suggested the pattern placement from my experience with ultralight aircraft back in the early '80s, when I built an ultralight and powered it with a converted Kawasaki 440 snowmobile engine. I used a wooden prop from Ritz Propeller Co., and the instructions warned about the 6-bolt prop-hub pattern. With the prop placed horizontally, there should be a hole at the 12 and 6 o'clock positions (not at 3 and 9 o'clock). I've noticed that many full-size Piper Cubs and Taylorcrafts use the same 12 and 6 o'clock pattern, and I have carried this thinking into my giant-scale modeling. I suspect this doesn't really matter all that much for models, but maybe someone who has more technical experience will write in and set the record straight! *GY*

SURVEY WINNERS

Thank you to everyone who completed our April 2003 Reader Survey, and congratulations to these 25 prizewinners, who will each be sent a copy of "Ultimate RC Flight Guide."

Dorwin Aaron, Quitman, AR; Keith Kivi, Overland Park, KS; Eduard Meyer, Thoerishaus, Switzerland; Michael Bavcom, Statesboro, GA; Alan Hill, Lincoln, NE; Pete Engel, Melbourne, FL; Ryan Richards, North Adams, MA; Marshall Head, Oceanside, CA; Robert Osborne Jr., Cincinnati, OH; Paul Garceau, Mt. Clemens, MI; Robert Bailey, Danville, AR; James Sundy, Harrisburg, PA; Leon Prokuski, McHenry, IL; Paul M. O'Dell, Calumet Park, IL; James Connor, Industry, PA; Cleveland Shiufrs, Seaside, CA; Bill Grippo, Bullhead City, AZ; John Palm, Niceville, FL; Donald Fuster, Spring Lake, MI; Glenn Tuttle, Greensboro, NC; Pete Shirkiey, Portland, OR; H.L. Fredericks, Harlingen, TX; Fred Blanck, Wichita, KS; Geo Sing, Glendale, AZ; Pedro De Los Santos, New York, NY.

The following 25 readers win a one-year subscription to *Model Airplane News* or a renewal of their current subscription:

Lawrence Marriott, Riverside, CA; Richard Groth, Export, PA; Greg Hunter, Tulsa, OK; Jon Gilliland, Fremont, MI; Jack Evans, State College, PA; Jay Byard, Levering, MI; Gene LaFond, Wenatchee, WA; Dave Surace, Hawthorne, NJ; Gary Stonehill, Rocklin, CA; George Boardman, Lovettsville, VA; David Klemenhagen, Shakopee, MN; Irwin Esses, San Mateo, FL; Dale Elder, Redding, CA; John Brickley, Granger, IN; David Swaddling, Hilliard, OH; Dennis Barlow, Newcomerstown, OH; Richard Herrington, Tomball, TX; Thomas Roache, Carrollton, TX; Don Patterson, Troy, MI; Denne Osgood, Fayetteville, NC; Richard Kehrer, Waterford, MI; Richard Prann, San Juan, Puerto Rico; Edmund Smith, Ridgecrest, CA; Thomas Walker, Nettie, WV; Tony Paladino, Ontario, Canada.

And a *Model Airplane News* T-shirt is on its way to each of these 10 readers:

Kevin Dallon, Brigham City, UT; Norman Nash, Wylie, TX; Hector Morales, Toa Baja, Puerto Rico; John Deisher Sr., Salem, VA; William DeGeneres, Coarsegold, CA; Richard Lowe, Albion, NY; Michael Jimenez, Canton, GA; Frank DeSanctis, Island Park, NY; Charles Lee, Chillicothe, OH; Peter Pawlik, Largo, FL.

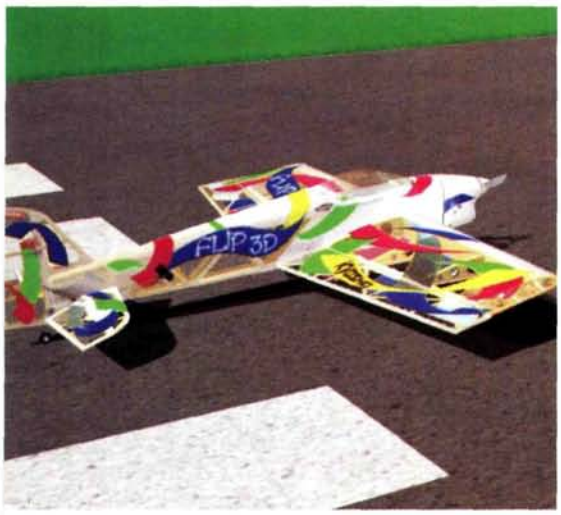
WE NEED YOUR HELP!

In 2004, *Model Airplane News* will commemorate its 75th anniversary! We're excited to celebrate this milestone, and we want to remember and give credit to all of the amazing modelers who have written for *Model Airplane News* over the past seven and a half decades. We know that you, our readers, made this 75th celebration possible, whether you've been reading since 1929 or last month! We hope that you'll take a moment to jot down your favorite *Model Airplane News* article or column, or even a special memory associated with the magazine, and email it to us at man@airage.com. You can also send it to "75th Anniversary," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. We hope to use as many of your recollections as space will allow in our special 75th Anniversary Edition in January 2004, and throughout the year. Thank you!

AIR SCOOP

by the Model Airplane News *crew*

NEW PRODUCTS hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!



HOBBICO

REFLEX FLIGHT SIMULATOR & SKY SCREAMER

Flight simulators have become an established part of many pilots' flight training—not to mention that they're just a blast to play around with! The Reflex Flight Simulator has been a popular choice in Europe, and now, Hobbico has brought it to the U.S. for us to enjoy. It features many adjustable parameters that allow a variety of airplanes and environments to be accurately simulated. The attention to detail is admirable; little things like accurate profiling of landing-gear behavior and variable field-grass length allow you to simulate real-world challenges without risking your model's safety. Reflex comes preprogrammed with 15 fixed-wing and 12 heli aircraft. Look for the Reflex Flight Sim to sell for around $200.

Also from Hobbico is the Sky Screamer ready-to-fly (RTF) electric park flyer. Twin-motor differential thrust is becoming the preferred control method for entry-level backyard flyers—for good reason. When the thrust and turning functions operate with the same hardware, then overall weight, complexity and cost can all be kept down. That's great news for first-time pilots, as they can save money yet have a simpler, more durable model to learn on. The Sky Screamer's motors are mounted in the rearward-facing "pusher" configuration to aid in protecting the props during rookie landings. Just in case that precaution isn't enough, the Screamer comes with a pair of replacement propellers as well as a second wing and tail section. Of course, the radio and a charger come with the included 4-cell, 300mAh NiMH battery. That's a pretty impressive array of hardware for the projected price of $65.

Hobbico; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; hobbico.com.

SPORTSMAN AVIATION

HOT KNIFE 40

Distributed by Global, Sportsman Aviation's Hot Knife 40 represents the cutting edge of .40-size aerobatic performance. The 45.75-inch-span model features an ultra-thick airfoil, a full hardware package and lightweight wood construction that's fully covered. It's ideally suitable for a .40 to .52 2-stroke or a .61 4-stroke. With a 4-channel radio and five servos, the Hot Knife weighs between 3.75 and 4 pounds, which results in a wing loading of less than 14 ounces per square inch. Look for a street price of around $100.

Sportsman Aviation; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.

FALCON TRADING

TRIKE-GEAR FLOAT CONVERSION

Got a favorite model that would make a great floatplane, but the complexity of a tricycle-gear conversion is holding you back? Then check out Falcon Trading's conversion kit. It comes with carbon-fiber spreader bars, an injection-molded nose-gear strut fitting, nylon-coated pull/pull cable, a music-wire nose-gear strut and instructions—everything you'll need to convert virtually any trike-gear model to use Falcon's floats. The kit is just $20, so give Falcon a call and get on the water quickly!

Falcon Trading Co. (800) 591-2896; (219) 942-1134; falcon-trading.com.

ULTIMATE RC

P-38 & P-51 WARBIRDS

How's this for a winning pair?—an 83-inch P-38 Lightning and a 71-inch P-51 Mustang, both with air-operated retracts included! Both feature painted fiberglass fuselages (center pod and booms for the P-38) with built-up, balsa-sheeted and covered wings and stabilizer. All the hardware is included, as is the aforementioned air-retract accessory kit. The P-38 takes .46 to .61 2-stroke engines or .52 to .70 4-strokes; the Mustang needs a .91 2-stroke or a 1.20 4-stroke. Weight and wing area for the P-38 and P-51 are 13 pounds, 911 square inches and 11 pounds, 920 square inches, respectively. Six-channel radios are required for both if the retracts are to be operational. The P-38 costs $499; the Mustang costs $399.

Ultimate RC (866) 946-4626 (orders); (614) 539-5718 (tech); ultimate-rc.com.

NORTHEAST SAILPLANE PRODUCTS

Accord Rock & Roll

As the newest, biggest and most energetic of Northeast Sailplane's Accord series, the R&R really rocks! Designed specifically for 10-cell brushless motor power, the R&R combines comfortable slow-speed characteristics with excellent 3D aerobatic capability. The airframe is fully built and covered, and a nifty hatch on top allows easy access without removing the wing. Its weight is kept very low—only 28 ounces including landing gear, wheels and hardware. Just add a motor, ESC, battery and radio system (or opt for one of NSP's motor packages), and you'll have everything you need to put on your very own airshow at the local ball field. The price for the plane (without the motor system) is $219; packages with a brushless motor start at $289.

Northeast Sailplane Products (802) 655-7700; nesail.com.

SCHULZE

isl 6-330d

Schulze is well respected internationally for producing efficient, reliable, top-of-the-line chargers for electric flight. But the recent growth of the park-flyer segment convinced the folks at Schulze that the market was primed for a state-of-the-art charger for beginners. That might sound like a contradiction, but the features offered on the new isl 6-330d (version 8, if you're counting) will convince you that the description is appropriate. The unit is fully automatic but allows the user to specify a maximum charge-quantity setting for added safety with lithium cells. It also has a second set of outputs for charging your radio gear. The primary output can handle 1 to 30 Ni-Cd or NiMH cells, 1 to 19 lead-acid or gel cells, and 1 to 13 cells of any of the three lithium types: Li-metal, Li-ion, or Li-poly. This makes it among the most versatile chargers on the market, and the only difficult thing about using one is remembering the alphanumeric name! Price: $179.

Schulze; distributed by ICARE Sailplanes (450) 449-9094; icare-rc.com.

REVOLUTION

HELI MUFFLERS

Horizon is serious about supporting the RC heli hobby, and pilots take notice when it releases a new heli product—and they should. The new line of Revolution mufflers is sure to be a hit with fliers who favor helis of virtually every size. Available for .30- all the way up to .90-size engines, these stylish pieces are light, quiet and easy to install. Most important, they offer substantially increased performance over stock mufflers—looking cool is just icing on the cake! Prices vary with engine size, but the .30-size muffler starts at just $31.99.

Revolution; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

GWS

CORSAIR

GWS continues to establish itself as a leader of the park-flyer movement with its outstanding line of semi-scale ARF electrics. The latest is this F4U Corsair. Like its predecessors, it's made of injection-molded foam that's available prepainted, so it's a snap to assemble. An EPS300C gear-drive system is included, and the plane can be built with or without the included landing gear. We're betting the scale-looking polyhedral wing will give it excellent flying characteristics, too! The painted version is just $59.99; unpainted, it's $10 less.

GWS; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com; gws.com.tw.

GLOBAL

MIGHTY MUFFLERS

New from Global are the Magnum and Pitts mufflers. These cast mufflers come with O-ring seals, silicone extensions and gaskets, and they feature adjustable exhaust angles to better fit your favorite model. Best of all, they reduce noise without draining power, so you can meet club regs and be kind to the locals without sacrificing performance. Price varies with style.

Global Hobby Distributors (714) 963-0329; globalhobby.com.

CARL GOLDBERG PRODUCTS

ELECTRA & GENTLE LADY ARFS

The Electra and Gentle Lady sailplanes have been popular kits for years, and the new ARF versions are sure to expand their appeal to a whole new generation of modelers. Both have jig-built, all-wood airframes that come fully covered and 90-percent assembled. Both feature 78.25-inch wingspans for exceptional glide capability, and the Electra includes a motor. Just add your preferred 2- or 3-channel radio, an ESC and a battery, and you'll be ready to hit the slopes!

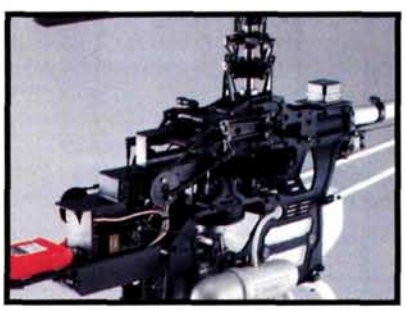
Carl Goldberg Products; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; greatplanes.com; carlgoldbergproducts.com.

HIROBO

SCEADU EVOLUTION

Updating a successful product design is inherently risky; just how much should you tamper with success? That was the question facing the folks at Hirobo as they contemplated the release of the Sceadu Evolution. Given the popularity of the original Sceadu 30/50, it was decided that the changes should be progressive without being drastic—hence the name "Evolution." Key changes include more durable plastic parts, a larger fuel tank (480cc, up from 330), a new rotor-head design that's more reactive for 3D maneuvers, a chassis that can accommodate any 50-size heli engine and a third-bearing block as standard equipment. The best news for current Sceadu owners is that the new parts can all be retrofitted to the original Sceadu design. The 30-size base with wooden blades and a muffler is expected to cost about $300; the 50-size without blades or muffler is expected to cost $400.

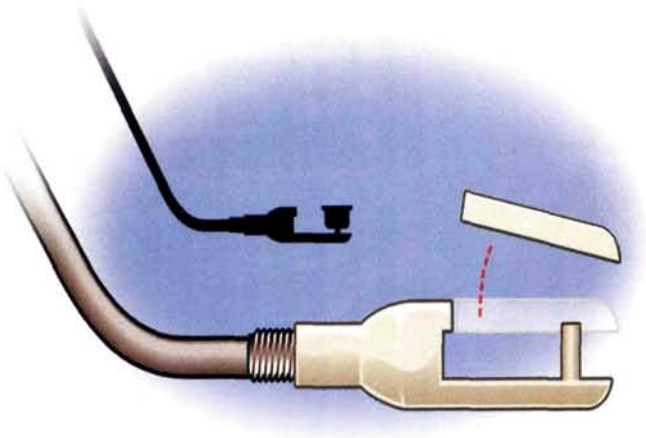
Hirobo; distributed by MRC (732) 225-2100; modelrectifier.com.



TIPS & TRICKS

Illustrations by David Baker

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.



REACHING OUT

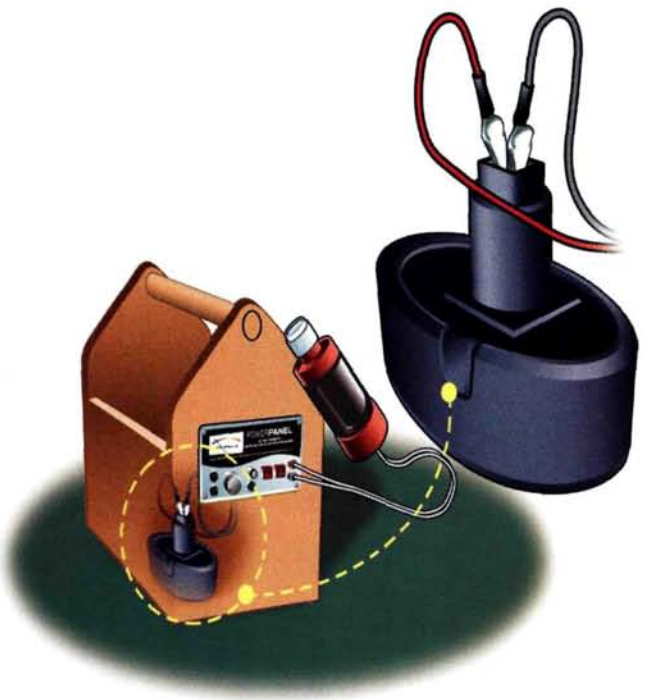
Need a simple, cheap tool to install a nut in a hard-to-reach place? Take a length of 2-56 rod that's threaded on one end, and attach a plastic or nylon clevis. Now remove the part of the clevis without the pin, and you'll have a small "finger" that will hold a nut or blind nut. You can bend the rod to almost any shape to get the nut where needed.

Paul C. Ethier, Chicopee, MA

HIDE THE ANTENNA

Tired of having the last few inches of your receiver antenna whipping around when you fly your model? Here's a simple technique to hide the end of it. Drill a hole in the vertical fin's leading edge, and glue in a short length of inner Nyrod. Slide a piece of heat-shrink tubing over the antenna, and insert the antenna into the fin. Put some tension on the antenna, and apply heat to the heat-shrink tubing—a clean, neat installation.

Steve Gembrowski, Pinconning, MI



MORE THAN ONE USE

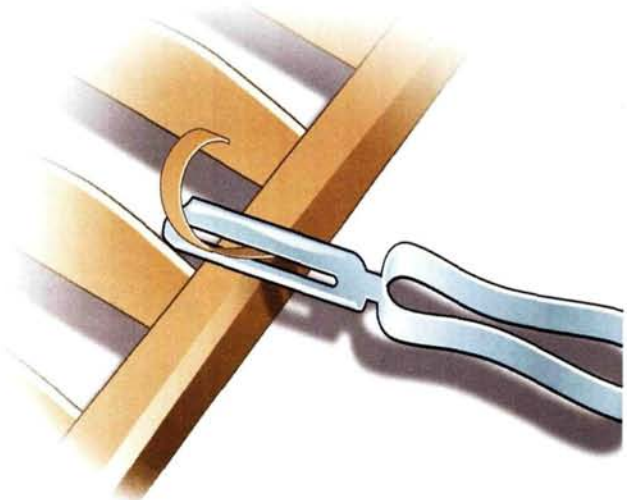
Many modelers use a lead-acid battery to energize the power panel mounted in their flight box. A lead-acid battery has many disadvantages associated with it, not the least of which is its corrosive nature. Why not get double duty from your cordless drill battery instead? Simply make a patch cord to attach to the battery's terminals, or use the alligator clips from the power panel. The drill battery has enough juice for a full day of flying, and you'll no longer have to worry about acid spills if it tips over.

Mark Tescari, Muskegon, MI

HANDY CARVER

Do you have to carve some balsa, but you've lost or misplaced your razor plane, and the hobby shop is closed? Here's an alternative that's as near as the gadget drawer in your kitchen—a vegetable peeler! This handy tool works great to carve leading edges, turtle decks and other areas where you need to remove balsa quickly and easily. Don't let your wife in on the secret, or you'll be peeling potatoes!

Bill Hankins, Sacramento, CA



PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

P-47 THUNDERBOLT

John Shortall, St. John's, NL, Canada

Sporting the markings of "Lucky," WW II ace pilot Robert Johnson's favorite plane, this 63-inch-span model is powered by a SuperTigre .75 engine, has SpringAir retracts and uses a Futaba Super 8 radio for control. John built the 10-pound model from a Top Flite kit, and he writes, "This is a beautiful aircraft to fly." We're sure he's right.

FOCKE-WULF 190

Charlie Elwell, Blackwood, NJ

With its hand-painted latex markings, functional scale exhaust, scale cockpit, sliding canopy and concealed switches, this Fw 190 does kit maker Vailly Aviation proud. The 90.5-inch-span plane weighs 33 pounds and is powered by a G-62 engine. Charlie also added a functional cooling fan behind the spinner, Vailly retracts and a Pilots by Diane WW II figure for the cockpit. He notes that he worked on this project for two years. We think it was time well spent.

SKYBOLT

Stan Sawyer, Melbourne, FL

Built from an older Sig kit, this model features all-balsa construction, upper and lower ailerons and dual cockpits. Stan replaced the plastic upper turtle deck with balsa framework and reinforced the cowl with fiberglass. The 45-inch-wingspan plane is covered in MonoKote and uses a Saito .65 4-stroke for power. Stan writes, "It's a blast to fly!"

STEARMAN HAMMOND Y-1-S PUSHER

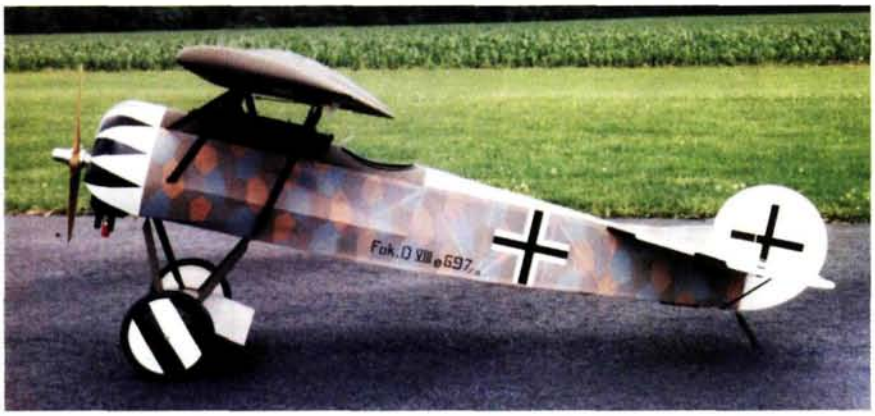
Richard Franco, Freemont, CA

Inspired by a commuter plane that used to fly into and out of his hometown 64 years ago, Richard decided to design and scratch-build his own model version. His 60-inch-wingspan model is well powered by an O.S. .26 4-stroke and will even loop and roll. Nice job, Richard!

DE HAVILLAND DH-53 HUMMINGBIRD

Gerry Becker, Bellingham, WA

A longtime aficionado of little-known planes of the '20s and '30s, Gerry knew he wanted to build a Hummingbird the first time he saw a photo of one. He obtained 1972 plans for a free-flight model from Bill Northrup's Plans Service but decided to enlarge them and build a 4-channel plane. His 6-pound, 63-inch-span beauty is powered by an O.S. .52 and is covered in 21st Century Coverite fabric. Futaba radio gear keeps this plane on track.



FOKKER D-VIII
Carl Schurenberg, West Chester, OH
Built from a Balsa USA kit, this ¼-scale model has an 82-inch wingspan and is powered by a Zenoah G-26. Carl covered the wings in Solartex fabric and the fuselage in Arizona Model Aircrafters printed "lozenge" fabric. He notes, "I found the cowl's paint scheme daunting, but black paint covered by carefully placed white vinyl triangles solved the problem." It's an outstanding plane, Carl.

1938 MERCURY
Bob Svetovich, Port Charlotte, FL
Bob built this plane from Scientific's plans and converted it from free flight to use 3-channel control. The 72-inch-span plane uses an O.S. .40 for power and is covered in MonoKote. Williams Bros. antique wheels add the finishing touch. Bob writes, "With a little breeze, it will float all day on idle."

B-24

Bob Vanderveen, Ramona, CA

Finished in time for the 60th anniversary of the famous Ploesti raid on the oil refineries in Bucharest, Romania, during WW II, this Jack Stafford kit was modeled after the "Brewery Wagon"—a bomber that flew in the first wave of attacks. The 90-inch-span plane features a foam-core wing, a fiberglass finish, original Goldberg retracts (fitted with Robart cylinders) and operational flaps. Bob also added a full interior that includes a plastic intercom system, suit heaters, oxygen-mask connections and more! Four O.S. .25 engines provide power.

CANARD VERSION III

Martin O'Neill, Placentia, CA

Because he likes to "... think outside the norm and try some unusual models," Martin has built three canards to date. His latest one, powered by an O.S. .40 engine, is 6½ feet long and uses 3-channel control. Martin flies with the Circle City Flyers in Corona, CA.

by Dave Garwood

the Best in Power

2003 Southern California PSS Festival

Brian Koester loves the Sukhoi Su-35 Super Flanker, so he designed and built his own. Watching this one in the air reminds you of the awesome airplanes to come out of the former Soviet Sukhoi design bureau.

People who design, build and fly power scale soaring (PSS) planes delight in the way warbirds, fighter jets and bombers look, but they also enjoy the peace and tranquility of silent flight. An exciting, specialized component of soaring, PSS is inspired by aircraft that are powered by piston engines, jets and rockets, but these models fly without power. Although some PSS sailplanes could fly in thermal lift, they are most commonly flown in slope lift.

The Southern California PSS Festival is the largest gathering of pure PSS gliders in the Western Hemisphere. Held on May 23 through 25, 2003, this was the sixth year that the Inland Slope Rebels club in Riverside, CA, ran the event, making Cajon Summit a mecca of power scale soaring. We always like to see what other PSS modelers are designing, building and flying, so it's a great time when 50 or more of us get together to show our stuff!

The flying site is a mile-long ridge 1,800 feet above the Cajon Pass in the San Bernardino National Forest, a few hours east of Los Angeles. This site is known for its reliable winds created when the high desert to the east heats up and draws air through the Pass and up the face of the ridge.

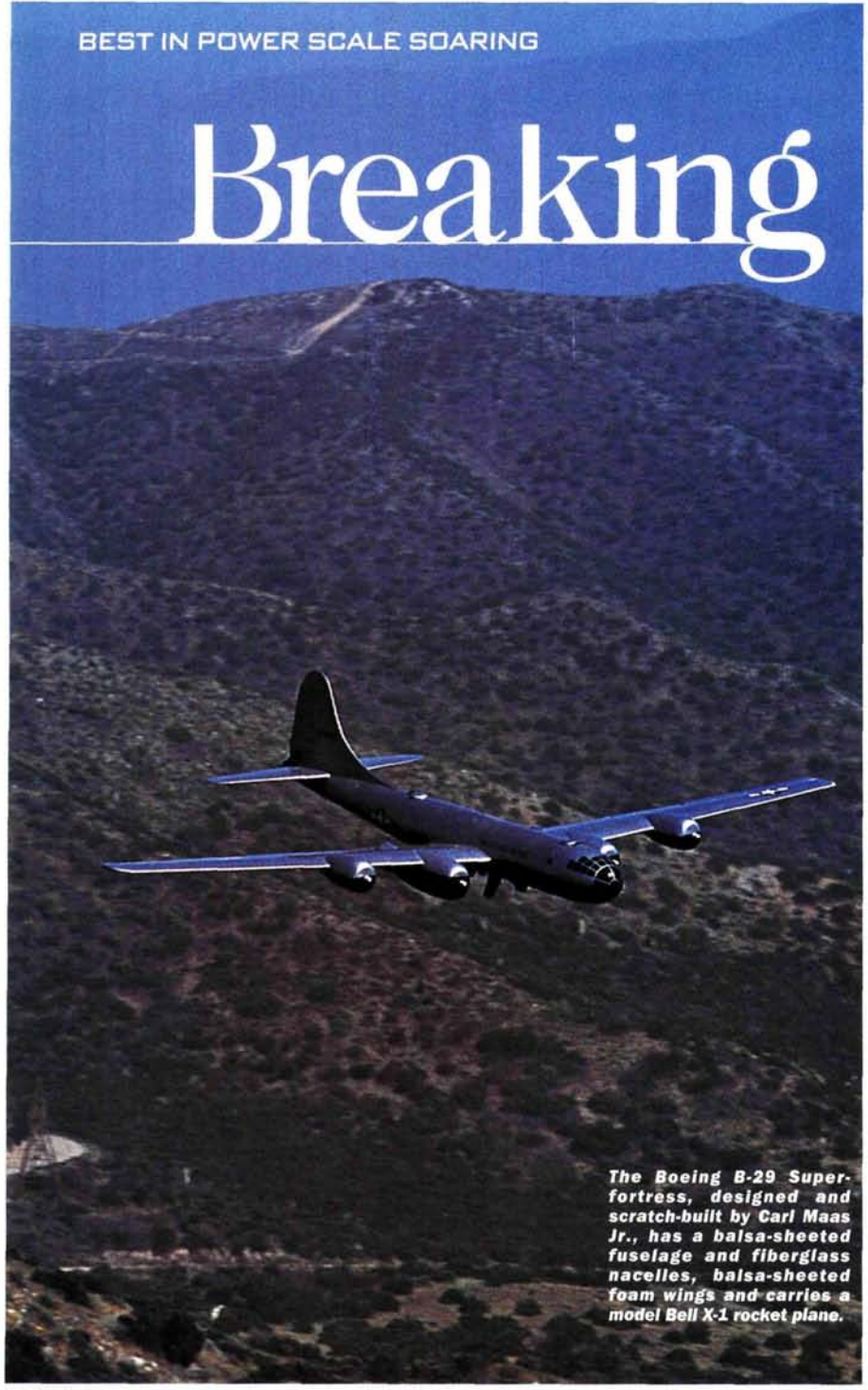
PHOTOS BY DAVE GARWOOD & JOE CHOVAN

A Patton Aircraft foam Mustang and a Spitfire dance in the air. The snow-capped mountains are visible across the valley from the Cajon Summit flying site.

Scale Soaring

Tom Ramirez launches a Durable Aircraft Models P-51 at the main hill. Other slope-soaring notables in the photo are designers Brian Laird and Wade Kloos and photographer Joe Chovan.

Breaking the Sound Barrier



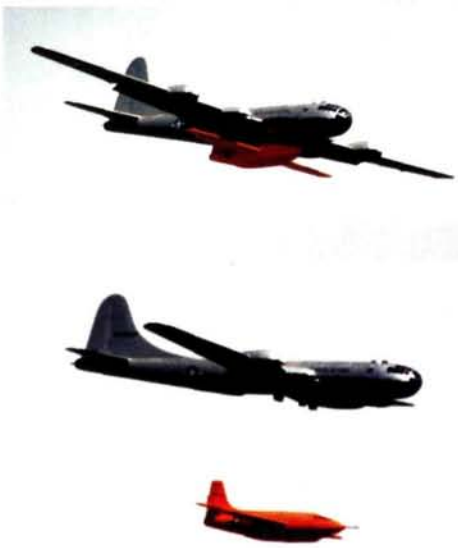
The Boeing B-29 Superfortress, designed and scratch-built by Carl Maas Jr., has a balsa-sheeted fuselage and fiberglass nacelles, balsa-sheeted foam wings and carries a model Bell X-1 rocket plane.

This Bell X-1 rocket plane built out of carved EPP foam by Carl Maas Sr. is a model of "Glamorous Glennis," the plane in which Chuck Yeager broke the sound barrier.

Not many planes say "PSS" like a scale model of a four-engine bomber flying as a glider. This year, the father-and-son team of Carl Maas Jr. and Sr. put on a PSS display in spades. Carl Jr. built a 109-inch-span Boeing B-29 Superfortress, and Carl Sr. built a 36-inch-span Bell X-1 rocket plane, a model of "Glamorous Glennis" that Chuck Yeager flew to break the sound barrier. Because of limited fuel aboard the X-1, the B-29 carried the experimental plane to altitude and released it just before the rocket engine was fired. This historic scenario of man's first flight faster than sound was re-created in miniature when the B-29 with X-1 attached underneath was launched. The B-29 flew well with the X-1 and made several passes for the crowd before it climbed to altitude and released the X-1 to fly on its own, piloted by Carl Sr. Both planes flew well, presented an extremely memorable scenario and were landed safely.

The B-29 fuselage was made of blue foam blocks glued together and cut to shape with a hot wire then sheeted with balsa and covered in MonoKote. The wing-cores are hot-wire-cut blue foam, sheeted with balsa and obechi and covered with MonoKote. The engine nacelles were molded in fiberglass and painted.

The X-1 was carved from EPP foam, covered in Solartex and painted with Krylon.



The Boeing B-29 releases the Bell X-1 rocket plane.

Brian Laird's latest design is an EPP-foam "Air Rage" Mustang Reno racer. After designing in fiberglass for 15 years, Brian applied his talents to EPP foam, and this development led to two new kits from Leading Edge Gliders—this P-51 and an Me-109.

Steve Patton's Messerschmitt Me-262. Typical of Patton Aircraft's fast foam planes, it flies very well and is one of Steve's favorites.

A sample of the high craftsmanship typical of the 150 or so planes at the event: Steve Patton's Curtiss P-40 Warhawk, Tony Matyi's Grumman F6F Hellcat, Joe Chovan's Mitsubishi Zero and Dave Garwood's Zero. Some guys build planes in pairs so they will have similar performance for slope-scale parties.

Above: here, Carl Maas Jr.'s Boeing B-29 Superfortress is being launched carrying Carl Maas Sr.'s Bell X-1 rocket. Below: Steve Greenfield of California Sailplanes carries his 60-inch-span, EPP-foam "Monster Tigershark," a scaled-up version of the successful Canterbury Sailplanes EPP-foam F-20 kit. I flew the big F-20 and found that the docile flyer is fully aerobatic within its 2-channel aileron and elevator control limits, easily pulling fast axial rolls and graceful loops.

Patton Aircraft EPP-foam Supermarine Spitfire. Steve Patton is known for thinning the wings to reduce drag and increase speed.

This year, 54 pilots registered, and more than 150 sailplanes were shown and flown. We had superb weather and plenty of lift for all three days. The wind "turned on" around 10 a.m. each day and gave us a 20 to 30mph flow of air straight up the hill, under clear skies and in balmy Southern California T-shirt temperatures. Sunday was refreshingly cooler, and the wind speed dropped to 15 to 25mph; some people put on sweatshirts but still flew as much as they wanted.

The event schedule itself is relaxed. The only rules: fly nothing but PSS planes from noon to 6 p.m., and fly the fast planes on the left hill and slower planes on the right hill. Foamie combat is allowed as long as the planes are warbirds. If they like, pilots may enter their planes in a judged contest and compete for awards in four groups: best jet, best propeller plane, best civilian plane and best foam plane. Two new award categories were introduced this year: an Expert class and a Craftsmanship award.

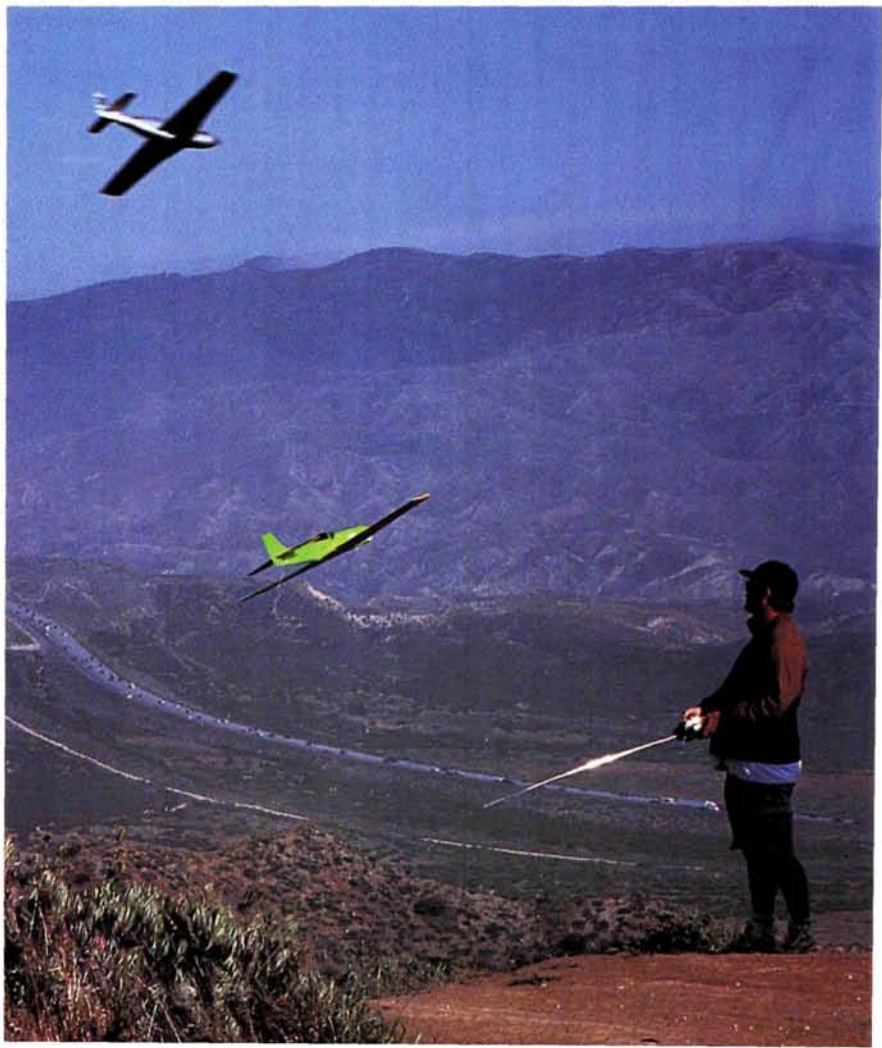
In addition to the flying and the awards, we enjoyed the trademark Big Lunch put on by ISR spouses on Saturday and a daily slope-scale party, where eight or more high-wing-load PSS planes fly stall turns on both ends of a "half-pipe pattern" in an extreme adrenaline-rush formation. We lost a few to midair collisions, but hey: no guts, no glory!

The two biggest complaints registered with the event management this year were "Too much wind" and "Sandwiches too big." Slope soaring just doesn't get any better than this! Many thanks to major sponsors Airtronics, Hitec RCD, Leading Edge Gliders and Hobby People for making this event possible. For more photos of this and previous PSS Festivals and for information about next year's event, see the ISR website at http://ourworld.compuserve.com/homepages/ISR.

Event director Brian Laird launches his Sukhoi Su-25 Frogfoot, the Soviet counterpart to the American A-10 Warthog. This fiberglass fuselage and sheeted-foam-wing model was the first one out of the mold at the "Carlski Maaskovitch" design bureau.

David Cairns designed and scratch-built this balsa Boeing B-52 Stratofortress and finished it in Vietnam-era colors and markings. Not too many builders are willing to land a slope plane with engine nacelles hanging beneath the wing!

A view of the Cajon Pass valley from the main flying site. The pilot is Brian Courtice of Hawaii, who left the Pacific trade winds to try some California inland slopes.



EXCLUSIVE 1ST LOOK!

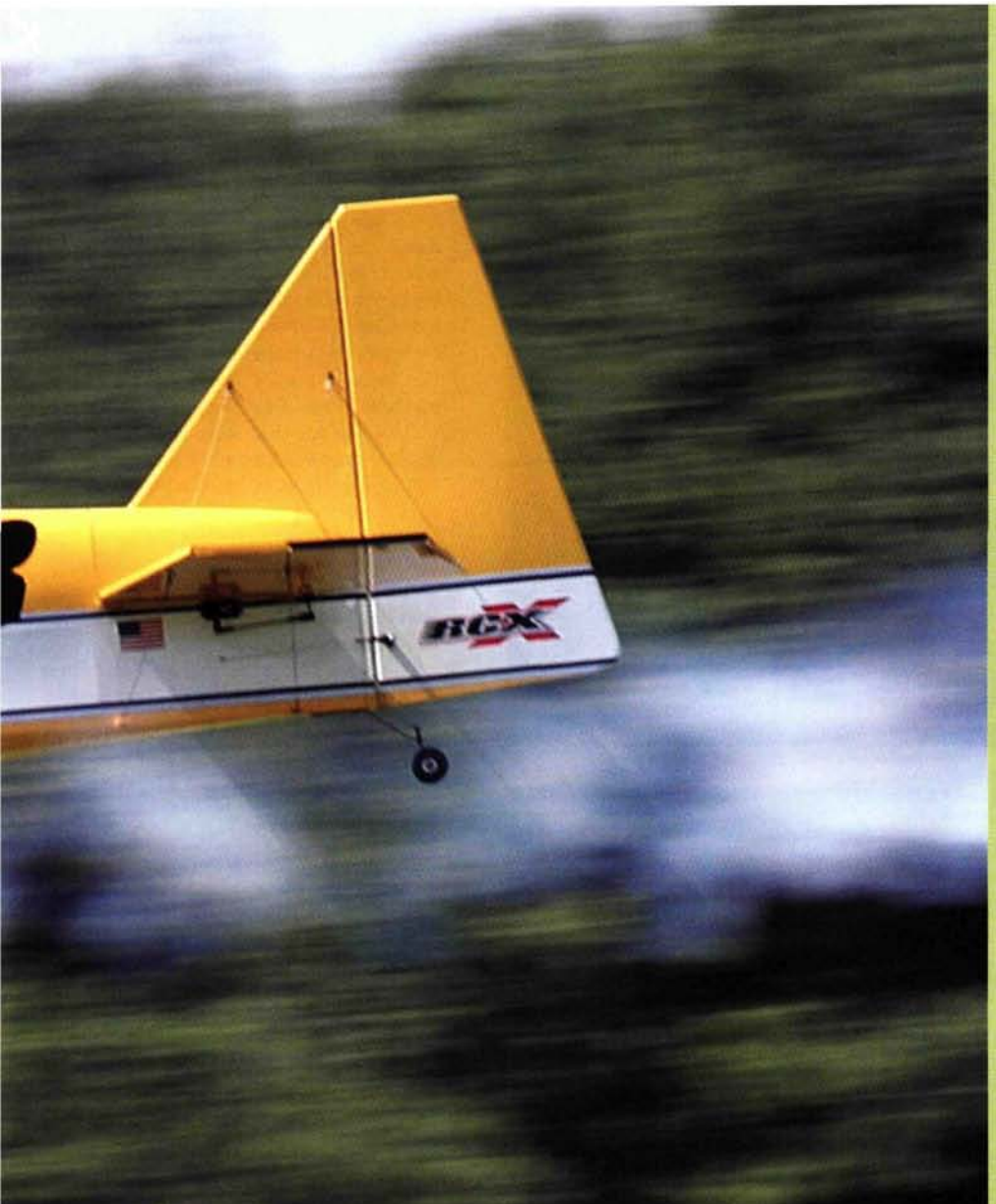
It isn't every day that we get the chance to test-fly a company's very first production model to come into the country! When executive editor Debra Cleghorn told us that Horizon Hobby Distributors had requested that we review the brand-new, gigantic, 46% TOC Ultimate 10-300 from Hangar 9, we jumped at the chance! Talk about pressure! We would have less than two weeks to build, set up, fly, evaluate and photograph this big, beautiful biplane. We also had to meet a very short deadline to get the article in the October issue! This is one hell of a job, but someone has to do it—right?

The first thing Rick Bell and I had to do was to find a local builder who was not only equipped for the task but also had plenty of giant-scale experience—someone we could count on to do the job right. Our old flying buddy Sal Manganaro of Newtown, CT, agreed to take on the project. To make things even better, Sal already had a Desert Aircraft DA-150 engine just waiting for an airplane.

by the Model Airplane News *crew*

HANGAR 9 46% Ultimate

A giant-scale biplane



After a few calls and a lunch meeting, we all agreed to our appointed tasks. Sal would build and pilot the finished 10-300, I would coordinate with the manufacturers of the accessories that we needed to complete the project, help Sal with the building tasks and turn his shop notes into the finished article. Rick would research and write about product information, set up the flying-field accommodations and assist Sal with the flight evaluation.

Gee, I just love it when a plan comes together! Were we successful? Check out this one-of-a-kind "Flight Test" and find out! *—Gerry Yarrish*

10-300

with TOC performance!

Associate managing editor Jaime Studd shows off just how big the Ultimate 10-300 really is.

SPECIFICATIONS

MODEL: 46% TOC Ultimate 10-300

TYPE: giant-scale biplane ARF

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby Distributors

WINGSPAN: 100 in.

WING AREA: 3,310 sq. in

WEIGHT: 40 lb.

WING LOADING: 27.85 oz./sq. ft.

LENGTH: 110 in.

ENGINE REQ'D: 150 to 200cc gasoline engine

ENGINE USED: Desert Aircraft DA-150

RADIO REQ'D: 6-channel (with 15 servos)

RADIO USED: JR PCM 10X with 8411 servos (14) and an 8101 servo for throttle; three Duralite Plus battery packs used: one 2400mAh for receiver; two 3200mAh packs for servos.

PROP USED: Mezjlik 32x10

PRICE: $1,699.99

FEATURES: a factory-built fuselage and main hatch; a formed canopy; four wing panels; interplane struts and tail surfaces; a painted fiberglass engine cowl and wheel pants; a carbon-fiber landing gear; bolt-together aluminum cabane struts and a carbon-fiber top center rib; a tailwheel assembly; aluminum top and bottom wing tubes.

COMMENTS: the Hangar 9 46% TOC Ultimate 10-300 is an impressive factory-built aerobatic biplane. Almost ½ scale, the model is a true ARF and comes covered in Hangar 9 Ultracote in a yellow, white, black and silver trim scheme. It is balsa and ply and has carbon fiber in key stress areas to produce a light and strong aircraft.

Designed by Mike McConville, the Ultimate has plug-in wings and removable tail surfaces that make transporting this aerobatic giant a bit easier!

HITS

- Excellent construction quality and craftsmanship.
- Easy assembly.
- Very strong composite landing gear.
- Wonderful flight characteristics.

MISSES

- Must set up the top wing incidence and drill the carbon-fiber top center rib before final assembly.

PHOTOS BY PETE HALL, BERNIE HEBLETT & GERRY YARRISH

The Hangar 9 46% TOC Ultimate is a big model! For size comparison, the kit's major components are shown with editorial assistant Melissa Jones.

Designed by Tournament of Champions (TOC) competitor Mike McConville, the Ultimate offers true TOC performance in an exciting, gigantic package. Don't let its imposing size fool you; when you get used to its dimensions, you'll discover it truly is an ARF—and a beautifully engineered one at that!

The aircraft comes covered in Hangar 9 Ultracote, and the kit comes with a factory-built fuselage and main hatch, a formed canopy, four wing panels, interplane struts and tail surfaces. Also included are carbon-fiber landing gear, aluminum bolt-together cabane struts, a carbon-fiber top center rib, a tailwheel assembly and top and bottom aluminum wing tubes. The fiberglass engine cowl and wheel pants are beautifully painted to match the color scheme. Additional items that you'll need to complete the aircraft are highlighted in the instruction manual. It's much easier to build a model after you have acquired the necessary radio gear, hardware and accessories. This saves trips to the hobby shop and shortens the building time.

AILERON AND TAIL-SURFACE ASSEMBLY

The 72-page instruction manual is typical for Hangar 9 and is very easy to follow. Each section is well illustrated and also includes detailed photos. Begin assembly by installing the ailerons. The ailerons and wing panels come drilled for giant-scale Robart HingePoints (item no. 309); just epoxy them into place and check their alignment. After you've installed the ailerons, install the aileron servos and fabricate the control linkage. Sal used 8-32 Rocket City threaded control horns with SWB Mfg. servo arms.

Next, install the elevator and rudder hinges. The control surfaces are already slotted, but the slots must be enlarged to accept the giant-scale Du-Bro flat hinges. The tail surfaces are balsa covered with foam-core,

There are four ailerons, and each is driven by two servos. Eight, high-power digital servos provide loads of roll control!

but there is plenty of wood around the edges to properly support the hinges. The instructions suggest that you "pin" the hinges with toothpicks or small lengths of dowel. In the vertical fin, a strip of plywood runs the length of the rudderpost, so you must use a small drill bit to "chain-drill" the hinge slots. This technique is much easier than opening the slots with a Du-Bro pick and a slotting tool. Take your time, and make sure that all the hinges are aligned with one another before you epoxy them into place.

After you've hinged the tail surfaces, install the elevator horns and the vertical-fin alignment dowels. Mark the horizontal stabilizer's centerline, and bolt the stab into place in the stab-saddle area with four 6-32 bolts and blindnuts. Glue the vertical fin to the tail block, and slide the fin into place. The tail surfaces are removable. Two dowels at the top of the fin should match up with holes in the aft bulkhead, and two dowels at the bottom of the rudderpost should line up with holes in the lower fuselage. To hold the rudderpost tightly against the end of the fuselage, drill two 1/16-inch holes through the fuselage side and through the sides of the lower two alignment dowels. Thread two, 1/2-inch-long no. 2 sheet-metal screws into the dowels to secure them.

To complete the tail section, install the elevator servos and control linkage, assemble and install the four-servo, pull/pull cable control system, and attach the external rigging wires to the fin and stabilizer.

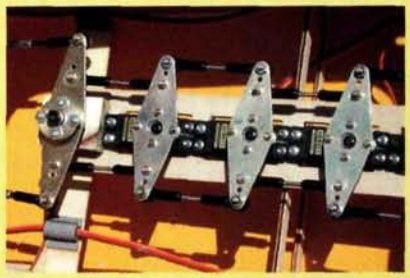
QUAD RUDDER POWER

4 INTO 1 CONTROL

Just in case you hadn't noticed, this biplane has one honkin' big rudder! It's huge! To move such an imposing control surface, four servos must be ganged together to actuate the internal pull/pull cable-control system. This isn't something you want to just cobble together in the basement. A quad-servo installation requires precise alignment and strong, adjustable linkages. Enter Nelson Hobby Specialties!

Jerry Nelson's quad-servo hardware features ball-link connections that are fitted to each end of 4-40 threaded rods to attach the servo arms to each other. The arms are precision-laser cut of aircraft-grade 2024-T3 aluminum and can be used to assemble several multi-servo control-system configurations. Four 2-56 Phillips pan-head screws and four 2-56 sub-miniature elastic stop nuts secure the arms to the servo's output wheel.

The system used in the Hangar 9 Ultimate bipe includes four 3-inch double servo arms, a 3¾-inch 180-degree tiller arm, eight interconnecting pushrods and 16 ball-link connectors. The tiller is



To move that big rudder, the internal pull/pull cable system is driven by four digital servos that have been ganged together with pushrods, ball links and aluminum servo arms.

connected to the stainless-steel control cables with Nelson's cable attachment fittings. The entire system produces nearly friction-free movement with incredible power transmission to the rudder! (These parts are available separately from Nelson Hobby Specialties. They can be used to make many control-system configurations. Call Jerry for prices.)

To eliminate any control-throw differences in the 4-servo setup, a single JR MatchBox is used to dial in each servo to precisely match the movement of the others. This prevents the servos from fighting each other and, in so doing, minimizes power consumption.

Nelson Hobby Specialties (877) 263-5766; nelsonhobby.com.

LANDING GEAR AND CABANE STRUTS

The main landing gear is beautifully molded carbon fiber, and it must be bolted to the engine box just in front of the main bulkhead. When you drill the attachment holes, make sure that you drill through the internal aluminum angle brackets. Then remove the brackets and roughen them with sandpaper. Epoxy them into place, and then bolt in the gear with 10-32 bolts and locknuts (make sure that the gear is angled rearward).

Finish the landing gear by installing the axles, wheels and wheel pants.

The cabane struts are made of flat, bent aluminum, and they fit into slots that have been cut in the top of the fuselage. Secure the struts against the internal plywood formers with 12, 8-32 socket-head bolts, washers and locknuts. Don't attach the top center, carbon-fiber rib yet.

WING INSTALLATION

Install all the interplane strut attachment brackets in the wing panels, and then slide the bottom wing tube into the fuselage. Center the tube so that equal lengths stick out on each side. Install the large blindnuts in the root ribs of each wing panel, and when the epoxy has set, secure each panel with a ¼-20 nylon bolt.

To install the top wing, slide the wing tube into one wing panel, and insert the tube through the hole in the carbon-fiber center rib; then slide the other wing panel onto the tube. Install the interplane struts and set the top wing in place; then clamp the top center rib between the cabane struts.

Follow the instructions for positioning the wing panels. Support the fuselage, and use an incidence meter to set the bottom wing at zero incidence; adjust the position of the top wing until the meter reads negative ½ degree. Then drill through the wing-attachment holes into the top of the cabane struts and into the top center rib's mounting tabs. Bolt the center rib to the cabane with two, 8-32 socket-head bolts, washers and locknuts. To secure the top wing to the wing tube, find the holes in the wing panels, remove the covering from them, and use a no. 44 bit to drill into the tube. Thread the holes with a 4-40 tap and secure the panels with two, ½-inch-long 4-40 screws.

Left: to assemble the top wing, slide the wing tube into a wing panel and then slide the carbon-fiber center rib over the wing tube. Below: slide the second top wing panel on the wing tube and pull the panel into position. Thread two 4-40 bolts through the panels and into the tube to lock the components into position. Bottom: a large wing tube also supports the bottom wing panels. Notice that the wing panels fit into openings in the sides of the lower fuselage.

ENGINE INSTALLATION

Before you hang the engine on the firewall, drill holes through the box structure and into the edges of the firewall so that it will be locked into place with 1-inch lengths of ⅛-inch dowels. Epoxy the dowels in the holes, cut off the excess length, and sand the edges flush with the box surface. Measure and mark the vertical and

JR MATCHBOX

SERVO MATCHING MADE EASY

Because the Ultimate uses multiple servos on each control surface, the servos must be precisely matched to minimize the drain on the flight batteries. To achieve this, five JR MatchBoxes are used on the flight controls. The four ailerons use two servos each, and one MatchBox is used for each control surface. The rudder uses four servos and a single MatchBox.

To minimize the number and length of the servo leads, the aileron MatchBoxes are secured near the ailerons, and the rudder MatchBox is placed near the rudder servos. The left ailerons (top and bottom) are hooked up as follows (the right ailerons use the same process): each pair of servos plugs into a MatchBox, and then the MatchBoxes are connected to a Y-harness that is plugged into the aileron receiver port. The receiver "sees" all of this equipment as a single servo. It's now easy to adjust each servo's centering position and endpoints so they all work together.

JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

The MatchBoxes that control and adjust the aileron servos are in the wing root of each wing panel.

Several MatchBoxes tame the fine tuning that's needed for the control-surface servos.

JR PCM 10X

PROGRAMMING MADE EASY

High-performance models like the 46% TOC Ultimate demand a high-performance radio, and the JR PCM 10X 10-channel system fits the bill nicely. Features such as the large touch screen and digital trims allow greater precision for advanced maneuvers. Pilots of any level can easily find and adjust the mixes and special functions with the 10X's menu.

Although the JR 10X has an onboard 10-model memory, it also includes the DataSafe PC interface software that allows you to interface your radio with a Windows 95/98/NT computer system to store an infinite number of model memories. Priced at $1,249.95, the JR PCM 10X system is a powerful radio that provides unlimited control flexibility.

The JR 10X PCM programmable radio provides flawless control for the gigantic Ultimate bipe.

FLIGHT PERFORMANCE

The 10-300 is a pleasure to taxi and has wonderful ground-handling characteristics. It turns smoothly in both directions with immediate and predictable response. The wide and long placement of its landing gear prevents any tendency to nose over or ground-loop. This is no doubt because of the model's very large rudder and its spring-loaded tailwheel assembly.

TAKEOFF AND LANDING

The first takeoff was so easy that I silently chuckled at how easily this giant left the ground! The ground run was straight down the centerline of the grass runway, and very little rudder coaxing was required to maintain a straight-as-an-arrow track. The Ultimate is simply a joy on takeoffs.

Landings are almost as easy as takeoffs, and for such a large airplane, it lands very slowly with positive pitch and roll control all the way to the touchdown. I noticed that ground effect allows the Ultimate to easily hold a 3-point attitude for a very long time and helps it settle in for a picture-perfect landing. I don't mean to be repetitive, but this model really is very easy and gentle to get on and off the ground!

SLOW-SPEED CHARACTERISTICS

As with all big biplanes, the model's large wing area provides a very comfortable wing loading, so you don't have to be afraid of slowing the model down (within reason!). When you ask the model to stall, it does so; it just shudders and then breaks straight ahead if the wings are kept level during the entry. Control remains positive right up to the break. When you release up-elevator and add a little power, it flies out of the stall with little effort.

HIGH-SPEED CHARACTERISTICS

At full power, the Ultimate is a very impressive beast! It retains its positive control feel and has unlimited vertical climb. Control feel is solid and isn't overly sensitive. For normal flying, ½ to ¾ throttle is all that's needed; save full-bore for takeoffs and vertical lines!

AEROBATICS

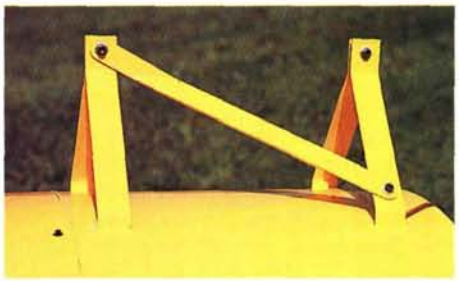
This is the fun part, and it's what the Ultimate was designed for. I started feeling out the airplane by performing both left and right rolls. The model stays dead-on at a level altitude and responds very quickly and crisply; no elevator correction is needed. I like very large, round loops, and the Ultimate has so much power that you can fly the maneuver as large as you like. I prefer to do loops with a little inverted "float" across the top so that I can adjust the line a bit for the back half of the maneuver. Loops are a snap.

Speaking of snaps, the model executes snap rolls in a heartbeat! Whether you do them at the top of a loop, from straight-and-level flight, when going straight up and down, or even on 45- degree up-lines, they feel very nice and are completely predictable.

Mike McConville has plenty of pointers in the instruction booklet for maneuvers such as torque rolls, blenders and other wild 3D stuff, so if you are up for it, this machine is more than capable of performing them with ease. I'm just a sport-aerobatics flier who loves big biplanes, so I'll have to work my way up to the wilder side. In the hands of an experienced pilot, the 46% TOC Ultimate 10-300 can easily do anything asked of it and will do it with authority! Now that I have this incredible performer in my hangar, I can't wait to go back to the flying field!

—Sal Manganaro

We found it much easier to assemble the top wing first and then attach it to the model as a single piece.



Made of flat, bent aluminum, the cabane struts are very strong. All of the attachment holes are predrilled, so the installation and alignment of the cabanes were very easy.

The tabs on the bottom of the top, center rib line up with the cabane struts. Two cap-head bolts and locknuts secure the top wing.

ELECTRODYNAMICS POW'R BUS PRO

WORRY-FREE SERVO MANAGEMENT

The power requirements of the servos needed to control a giant-scale model can be quite high, especially if you use a lot of digital servos—like in the 46% TOC Ultimate. With 15 digital servos at work during each flight, it's best to power the servos and receiver with their own battery packs. The ElectroDynamics EDR-111 Pow'R Bus Pro makes this easy.

This compact unit has separate power buses and isolates servo noise and power loads from the receiver. It can handle up to 6 channels (all the flight controls) and provides you with a way to attach a separate battery pack to power only the servos. Separate leads connect the EDR-111 to the receiver. In the Ultimate, two 3200mAh battery packs and two separate switches power the flight-control system. The throttle servo is plugged directly into the receiver and is powered by a third battery pack and switch harness. This system isolates the receiver from heavy power demands as well as from electrical interference that the servos might create with their long servo leads.

With so many digital servos on board, an ElectroDynamics Pow'R Bus Pro system and separate, high-capacity battery packs are used to manage the power requirements.

ElectroDynamics (734) 422-5420; electrodynam.com.

horizontal reference lines on the firewall, then clamp the engine to the firewall and transfer the marks for the attachment holes. Remove the engine, drill the holes in the firewall, and bolt the engine into place with four, 1-inch-long, ¼-20 cap-head bolts and blindnuts.

Cut an opening in the bottom of the box structure, install the throttle servo and hook up the throttle linkage. Install the fuel tank and plumbing, then screw or glue the box cover into place. Screws make it easier to access the fuel tank. Next, install the engine cowl and cut out the openings for the exhaust pipes and the front edges of the mufflers. Then install the prop and spinner.

FINAL ASSEMBLY

Glue the pilot figure into the cockpit, and roughen the inside edges of the canopy with sandpaper and glue it into place. Install the radio system and connect the servos, switch harnesses and battery packs. Check that all the components work as they are supposed

A beautiful, all-aluminum Tru-Turn spinner completes the engine package.

Left: the interplane struts are prebuilt and covered. They are secured with these aluminum attachment fittings. Right: the main landing gear is made of super-rugged, molded carbon fiber. It is attached to the engine-box structure just forward of the main bulkhead.

to, and make sure that the control throws are correct. *Here are the recommended amounts:*

- **Low-rate ailerons:** 26 degrees up; 25 degrees down.
- **High-rate ailerons:** 41 degrees up; 40 degrees down.
- **Low-rate elevator:** 15 degrees up; 20 degrees down.
- **High-rate elevator:** 33 degrees up; 31 degrees down.
- **Low-rate rudder:** 31 degrees left and right.
- **High-rate rudder:** 37 degrees left and right.

The recommended center of gravity (CG) is 9⅛ inches aft of the top wing's leading edge measured from the center of the wing.

That's it! When all is said and done, all you've really done is build an ARF—but boy, what an impressive ARF it is! If you take your time and do it right the first time, you'll have the hottest aircraft at the flying field when you're finished! Good luck!

THE MAN BEHIND THE MACHINE

The Hangar 9 TOC 46% Ultimate biplane is a stand-off-scale version of the "10 dash 300" Ultimate biplane. It started as Mike McConville's own design for his use in the 1993 Tournament of Champions (TOC) competition. Developed entirely with AutoCAD, Mike designed his airplane to take advantage of the extra bonus points TOC awarded for flying a really big airplane and a biplane! The original model used thin wings and was fully rigged with flying and landing wires between the wings. Further design study, however, showed that the model would produce less drag if a thicker airfoil was used without the rigging wires. The thicker wing would house the internal wing tubes, and without the many wire attachments, the model's field setup was greatly simplified. The Hangar 9 production model uses the thicker airfoil design.

Mike McConville shows off the prototype 46% TOC Ultimate 10-300.

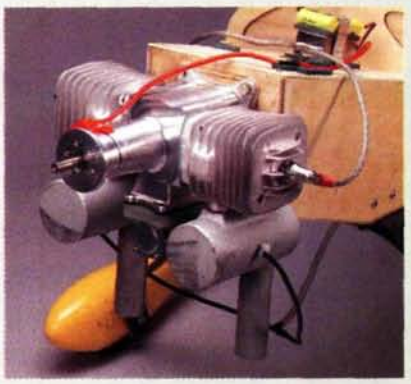
The Ultimate uses tried-and-true lite-ply, plywood and balsa-covered foam for most of its construction, and its wings are completely built up of balsa lite-ply and plywood. The removable tail surfaces are made with balsa-covered foam and have external wire bracing. Mike chose a NACA 0012, 12-percent-thickness airfoil and stretched the fuselage length a little. He enlarged the stabilizer 10 percent and lowered the top wing 10 percent as well.

Although most biplanes are viewed as having a disadvantage in aerobatic competition, Mike thinks that the Ultimate's "wow" factor and its really big, strong rudder make it worth considering! Mike tells us that in competition, you have to fly to its advantages and avoid performing the maneuvers it doesn't do as well as the monoplanes do. Although it doesn't turn as effortlessly as a monoplane, it does do incredible 3D high-angle-of-attack maneuvers. In knife-edge flight, the Ultimate needs almost no top rudder, and with its "positive" engine thrust line, it does wonderfully straight up-lines! When you neutralize the elevator stick, the model just keeps on going straight up; it doesn't try to level off or fly out of the up-line! Pitch coupling is almost nonexistent, and roll coupling is only very slight and requires less than 10-percent mix to dial out. It's just a very easy airplane to set up and fly. That's why it is Hangar 9's main showpiece!

ULTIMATE POWER

DA-150

Spinning the prop of our test model is the powerful and reliable DA-150 twin-cylinder 150cc gas engine from Desert Aircraft. Built with some of the latest manufacturing techniques, the DA-150 started out as a 3D CAD drawing and was engineered using stereo laser lithography technology. Designed from the ground up to be a world-class RC model aircraft engine, it has powered many Tournament of Champion and World Masters-style aerobatic aircraft. It is ideally suited to the Hangar 9 giant Ultimate bipe and powers it with authority.



The Desert Aircraft DA-150 is the powerplant for our 10-300. This is a match made in heaven!

SPECIFICATIONS

DISPLACEMENT: 9.15ci (150cc)

OUTPUT: 16.5hp

WEIGHT: 7.96 lb. (3.61 kilos)

BORE: 1.9291 in. (49mm)

STROKE: 1.5748 in. (40mm)

RPM RANGE: 1,000 to 6,500 (8,500 max.)

FUEL DRAW: 3.3 oz./min. at 6,000rpm

RECOMMENDED PROPS: 30x10, 30x12, 32x10, 32x12

PRICE: $1,495

FEATURES: the DA-150 features three crankshaft bearings (1.7 in. spread between front bearings); a standard Walbro carb with bottom induction and a 4-petal reed valve; Desert Aircraft auto-advance electronic ignition; DA cylinders, pistons and crankshaft; a 3-piece CNC-milled, 2024-T3 aluminum-alloy crankcase; and a 2-year warranty.

Desert Aircraft (520) 722-0607; desertaircraft.com.

click trip MODELAIRPLANENEWS.COM SEE VIDEO OF THE ULTIMATE IN ACTION

***Du-Bro Products** (800) 848-9411; dubro.com.*
***Duralite Plus batteries;** distributed by Performance RC (877) 744-3685; duralitebatteries.com.*
***Hangar 9;** distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*
***Mezjlik props;** distributed by Desert Aircraft (520) 722-0607; desertaircraft.com.*
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Lighting Technology for eye comfort

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The Balanced Spectrum™ Floor Lamp brings many of the benefits of natural daylight indoors for glare-free lighting that's perfect for a variety of indoor activities.

The Balanced Spectrum Floor Lamp will change the way you see and feel about your living or work spaces.

Ever since the first human went into a dark cave and built a fire, people have realized the importance of proper indoor lighting. Unfortunately, since Edison invented the light bulb, lighting technology has remained relatively prehistoric. Modern light fixtures do little to combat many symptoms of improper lighting, such as eye strain, dryness or burning. As more and more of us spend longer hours in front of a computer monitor, the results are compounded. And the effects of indoor lighting are not necessarily limited to physical well being. Many people believe that the quantity and quality of light can play a part in one's mood and work performance. Now, there's a better way to bring the positive benefits of natural sunlight indoors.

Use the Balanced Spectrum Floor Lamp...

...for hobbies...

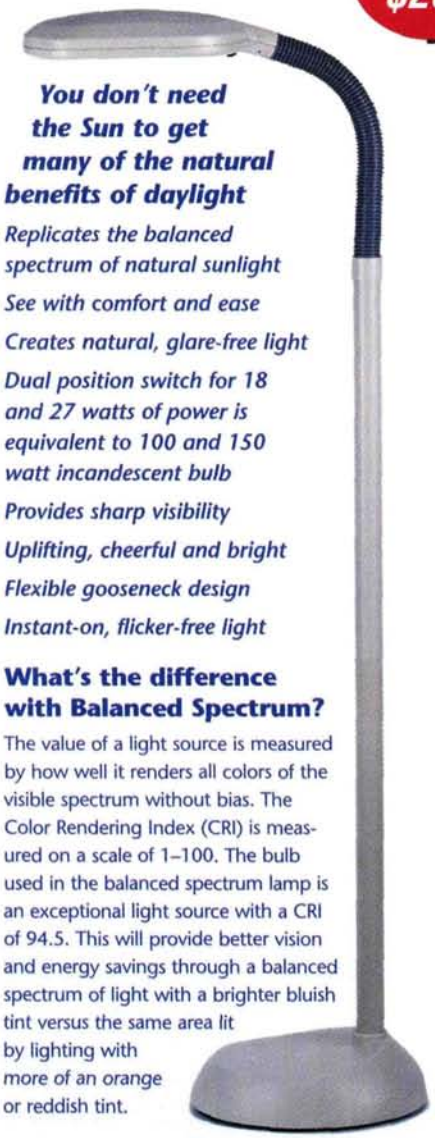
...at work...

...and when you need a source of balanced light for close-up tasks.

The Balanced Spectrum Floor Lamp will change the way you see and feel about your living or work spaces. Studies show that sunshine can lift your mood and your energy levels, but as we all know the sun, unfortunately, does not always shine. So to bring the benefits of natural daylight indoors, use the floor lamp that simulates the balanced spectrum of daylight. You will see with more comfort and ease as this lamp provides sharp visibility for close tasks and reduces eyestrain.

Its 27-watt compact bulb is the equivalent to a 150-watt ordinary light bulb. This makes it perfect for activities such as reading, writing, sewing and needlepoint, and especially for aging eyes. For artists, the Balanced Spectrum Floor Lamp can bring a source of natural light into a studio, and show the true colors of a work. This lamp has a flexible gooseneck design for maximum efficiency and a dual position control switch for 18 and 27 watts of power, with an "Instant On" switch that is flicker-free. The high fidelity electronics, ergonomically correct design, and bulb that lasts five times longer than an ordinary bulb make this product a must-see.

Try this special manufacturer rebate offer. The Balanced Spectrum Floor Lamp comes with a one-year manufacturer's limited warranty and a $20 rebate. Also, it has TechnoScout's exclusive home trial. Try this product for 30 days and return it for the full product purchase price if not completely satisfied.



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- *See with comfort and ease*
- *Creates natural, glare-free light*
- *Dual position switch for 18 and 27 watts of power is equivalent to 100 and 150 watt incandescent bulb*
- *Provides sharp visibility*
- *Uplifting, cheerful and bright*
- *Flexible gooseneck design*
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As a commercial photographer, I probably give more attention to lighting than most people and therefore was impressed with the smooth soft daylight quality of your lamp.

Dennis M.
Richmond, VA

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Hudson M.
Richmond, VA

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- *Shows true colors*

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GREAT PLANES LANCAIR

A SPORT-SCALE ARF WITH

PHOTOS BY FRED COLEMAN, DERON NEBLETT & DEBRA CLEGHORN

The Lancair ES is the result of a continuing evolution of a good design that the general aviation community has taken to heart. The ES certainly is one of the most exotic-looking homebuilt airplanes today, and it turns heads wherever it goes. Now you can get those same admiring looks on your flightline with the Great Planes Lancair ES ARF. Like its full-size brother, this classy sport-scale model has quickly developed a dedicated following—just check any modeling discussion group on the Internet. After flying the Lancair, I can see why.

ES ARF

ELEGANCE AND CLASS!

BY FRED COLEMAN

Here's the Lancair as it comes out of the box. It sports a beautifully painted fiberglass fuselage; the model assembles quickly.

SPECIFICATIONS

MODEL: Lancair ES

MANUFACTURER: Great Planes Model Mfg. Co.

TYPE: sport-scale ARF

WINGSPAN: 79.75 in.

LENGTH: 52 in.

WING AREA: 690 sq. in.

WEIGHT: 9 lb., 4 oz.

WING LOADING: 30 oz./sq. ft.

ENGINE REQ'D: .61 to .75 2-stroke or .91 4-stroke

ENGINE USED: O.S. FS .91SII-P 4-stroke

RADIO REQ'D: 5-channel w/7 servos (2 each for flaps and ailerons; 1 each for rudder, elevator, throttle)

RADIO USED: Futaba 6X w/8 Futaba 3004 servos (extra servo used on elevator)

PROP USED: Zinger 13x6/10

FUEL USED: Powermaster 15% 4-stroke blend

FEATURES: painted fiberglass fuselage with tinted windows installed; built-up wing and horizontal stabilizer covered with MonoKote; plug-in stabilizer; complete hardware package; fuel tank; wheels; painted two-piece aluminum landing gear; painted fiberglass wheel pants, cowl and wingtips; decals and photo-illustrated instruction manual.

COMMENTS: the Great Planes Lancair ES is a classy-looking model of a popular homebuilt aircraft. The curvy, lightweight fiberglass fuselage is factory-painted, and the colors match the MonoKote extremely well. Although my fuselage had some abrasions and chips on the vertical fin, they certainly didn't detract from the overall looks of the model. Where the Lancair really shines is in the air; its performance is nothing short of spectacular.

HITS

- Classy looks.
- Nicely covered with MonoKote.
- Matching painted-fiberglass parts.
- Spectacular flight performance.

MISSES

- Hinge slots weren't cut deep enough.
- Minor scuffs on fuselage.

THE KIT

The Lancair comes in a very colorful box with many photographs of the model that are helpful during assembly. To achieve the curvy, flowing lines of the fuselage, Great Planes wisely chose to make it of lightweight fiberglass. The vertical fin is also molded in, and the entire structure is beautifully painted. The wing panels, stabilizer, elevators and rudder are built of balsa and covered in MonoKote and trimmed to match the fuselage. All of the components are individually wrapped for protection, but my fuselage had a few abrasions, and the fin had some minor chips. The kit also includes hinges, wheels, painted fiberglass wingtips, wheel pants and cowl, painted-aluminum landing gear, a fuel tank, an adjustable engine mount, a spinner, a generous hardware package, decals and a photo-illustrated assembly manual. Did I mention that the tinted glass is installed at the factory? It took me only about 24 hours to get this beauty ready for flight.

ASSEMBLY

The 39-page manual contains a lot of information, and it's a good idea to read through it before you start any assembly. To outfit the Lancair, you'll need seven standard servos, a .61 to .75 2-stroke or .91 4-stroke engine; I used an O.S. .91 FS .91SII-P 4-stroke.

Wing. Begin the wing assembly by installing the ailerons and flaps with the included CA hinges. I found that the precut hinge slots were not quite deep enough, so I enlarged them with a no. 11 hobby blade. Next, after I removed the covering over the four servo openings (2 ailerons, 2 flaps), I installed the aileron and flap servos; you'll need an extension for each aileron servo. Because of the wing's thin airfoil, it's necessary to glue the aileron servos to the underside of the top wing surface. Instead of using epoxy as recommended, I used PFM adhesive; it should make it easier to remove the servo, if necessary. Great Planes' "Expert Tip" that you first shrink-wrap the servo with a battery sleeve before you glue it in place is also a good alternative. I then covered the aileron servos with the provided plastic hatch after I had trimmed it to size and opened a slot for the servo arm. I then screwed the hatches into place over the servos.

For 2-stroke engine installations, a portion of the fuselage bottom is removed and replaced with a recessed panel for cooling air to exit. Even though I used a 4-stroke, I cut out the panel anyway; you can't have enough cool air moving through the cowl.

The flap servos are installed on the underside of the plywood covers. I found that the covers fit a bit loosely and left small gaps around their perimeters. After you have mounted the flap servos on the

covers, check the servo-mounting blocks and make sure that they don't hit the plywood tabs to which the covers are screwed; mine required some trimming.

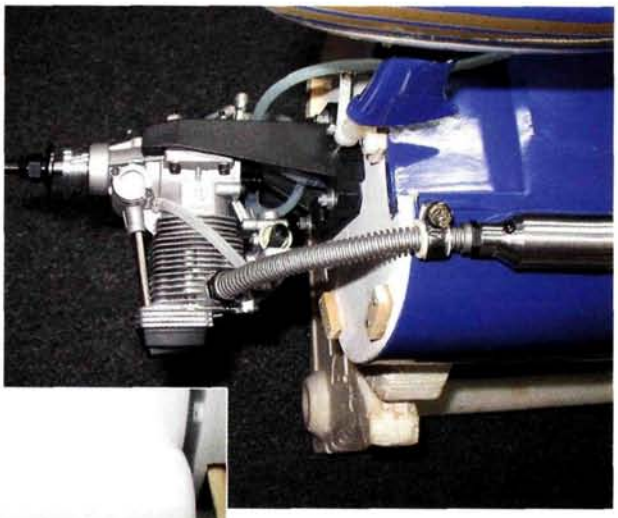
My kit came with an addendum sheet regarding the fact that the holes in the control horns and the backing plates do not line up. This isn't a big deal; just drill 3/32-inch holes in the horns so they line up with the holes in the backing plates. After I had installed the servos, I joined the wing halves, and they went together easily. All that was left to finish the wing was to add the painted fiberglass wingtips. The section on joining the wings recommends that you drill out the wing dowel holes in the fuselage with a 21/64-inch-diameter drill bit, but a 5/16-diameter bit works just as well.

Fuselage. The fiberglass fuselage is a great asset to this kit and a thing of beauty. Not only are the windows installed, but the servo-tray rails and the blind nuts for the wing hold-down bolts are also installed. I first opened up the pushrod exits in the fuselage with a rotary tool. To facilitate the installation of the pushrod tubes, I used the wire pushrods as a guide and then slipped the tubes over them and into place. When you glue the blocks for the front pushrod-support former into the fuselage, be sure to allow at least 3/8-inch clearance from the bottom of the servo-tray support rails to the top of the blocks. You need this room to be able to install the servo tray later.

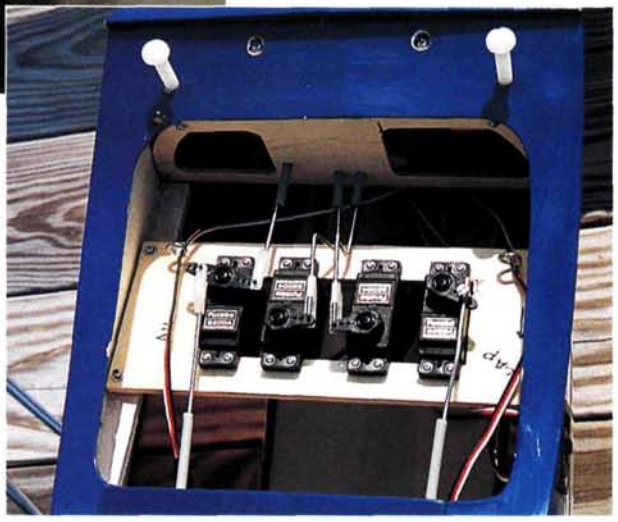
I then installed the removable horizontal stabilizer onto a carbon-fiber rod and an aluminum tube. The stab is screwed to the aluminum tube, or, for more security, you can permanently glue the stab into place. I now hinged the elevators and rudder and installed the control horns.

To power the Lancair, I used an O.S. .91 4-stroke engine and mounted it on the supplied engine mount. It's easier to install the engine-mount blind nuts on the back side of the firewall after you've cut the opening for the exhaust panel. I decided to mount the muffler on the outside of the fuselage (it doesn't fit inside the cowl very well), and I used an O.S. flex pipe (item no. 1111A) to extend the muffler out to a hose clamp that I modified by drilling a hole through it and securing it to the fuselage with a screw. I insulated the pipe from the clamp with a piece of silicone exhaust tubing.

I installed the exhaust air panel, even though the instructions say that you don't need to use it with a 4-stroke engine. To make it fit better, I shimmed out the nose-gear block with the panel in place so it would clear the panel and also line up with the holes in the engine mount. You'll need to drill holes for the throttle and steering pushrods. I relocated the pushrod holes in the front pushrod-support former to match my servo installation.



Above: the O.S. .91 4-stroke fits well up front. Note how I used a flex pipe to move the muffler out of the cowl. Left: with the engine mounted sideways, a cutout for the valve cover is needed. The oval hole is for access to the glow plug.



The radio compartment is spacious enough to accommodate four standard servos, which is good because I added an extra elevator servo. The receiver and battery pack are mounted on a plate behind the rear pushrod-support former.

The described method to glue the nose-gear-fairing halves together works great. The instructions have you mix together a batch of epoxy and microballoons to make a thick mixture. You then add this mixture to the inside lip of the fairings, turn them over, place them on a piece of wax paper and allow the glue to cure. After the glue cures, it will form an edge all around the inside of the fairings that then provides a gluing surface. I often wonder why I don't think of these things.

Installing the main gear and the wheel pants to the wing is pretty straightforward and takes only a few minutes. The only change I made was to substitute Sullivan 2¾-inch wheels for the kit's 2½-inch wheels to facilitate takeoffs and landings on our thick grass field. I was not able to increase the diameter of the nosewheel because the wheel pant is tight-fitting around the wheel. I also ground a flat on the axles so the setscrews would get a better bite. I now plumbed the fuel tank and installed it in the fuselage. Be sure to orient the tank correctly in the forward former.

Radio installation. The elevator, rudder and throttle servos are mounted directly under the wing in the fuselage. The elevator uses two pushrods that are joined together at the servo with two wheel collars. For peace of mind, I added a second elevator servo. I had to space out the other servos to accommodate the extra servo; there's plenty of room to do this if you decide to do the same. To reverse the travel of one of the elevator servos, I used a MAXX Products Miracle Y with servo-reversing.

The receiver and battery are mounted on a plywood plate that's screwed to the fuselage behind the wing's trailing edge. This arrangement is needed to balance the model without adding any extra weight, and it works; my model balanced right on the recommended center of gravity. I also used a MAXX Products combination heavy-duty switch and charge jack that I installed on the right side of the fuselage. I routed the

FLIGHT PERFORMANCE

When I first arrived at the field, I attached the wing to the fuselage and made sure that all of the control surfaces moved in the proper directions. I fueled and fired up the O.S. engine and tweaked it for the day's conditions.

TAKEOFF AND LANDING

The grass runway at our field is very thick and lush; combine this with the smallish front wheel and wheel pants, and takeoffs can be challenging. I aborted the first takeoff as the thick grass held the plane back. The second attempt was much better. I started the takeoff run further back on the runway and held a fair amount of up-elevator to lift up the nosewheel from the grass. The Lancair accelerated quickly and was up and away. On subsequent flights, I used flaps to increase the model's lift, and the takeoffs were effortless. Once airborne and at altitude, a click or two of right aileron was all I needed to attain level flight.

Landing the Lancair is so very easy. This plane is a pussycat. I land the Lancair with about ¼ throttle, and just before touchdown, I chop the throttle to idle, and the aircraft settles nicely to the ground. Even in the wind, the Lancair is rock-solid during approaches, and it tracks as if on a guide wire.

LOW-SPEED PERFORMANCE

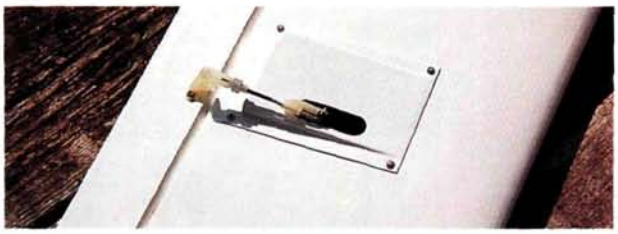
This airplane is not only good-looking, but it is also fun to fly. On low rate, it's as scale as they come. Flying into the wind at low throttle, I have to pull the nose up to stall the model. On stalling, the model just mushes nose down without tip-stalling. Adding power and some up-elevator has the Lancair quickly flying again.

HIGH-SPEED PERFORMANCE

Although this is a sport-scale model, it responds like a pattern plane, and its speed is deceiving. I'm sure the Lancair's slippery shape has a lot to do with this. At high speed, this plane shows no bad habits.

AEROBATICS

This is one area where the Lancair really shines, and it will do just about any maneuver in a very graceful, full-scale sort of way. Loops are big and round, and with a little power management, speed is uniform throughout these maneuvers. The roll rate with the recommended control throws is solid but not too fast and axial. During knife-edge flight, the Lancair makes it look as though you've practiced this maneuver for a long time. Just roll it on its side and apply rudder, and the Lancair responds with no fuss. Inverted flight requires some down-elevator to maintain level flight. This is one sweet-flying model!



The Lancair's airfoil is rather thin toward the wingtip, requiring that the aileron servo be glued to the underside of the top wing's balsa skin. A plastic cover is screwed into place over the servo.

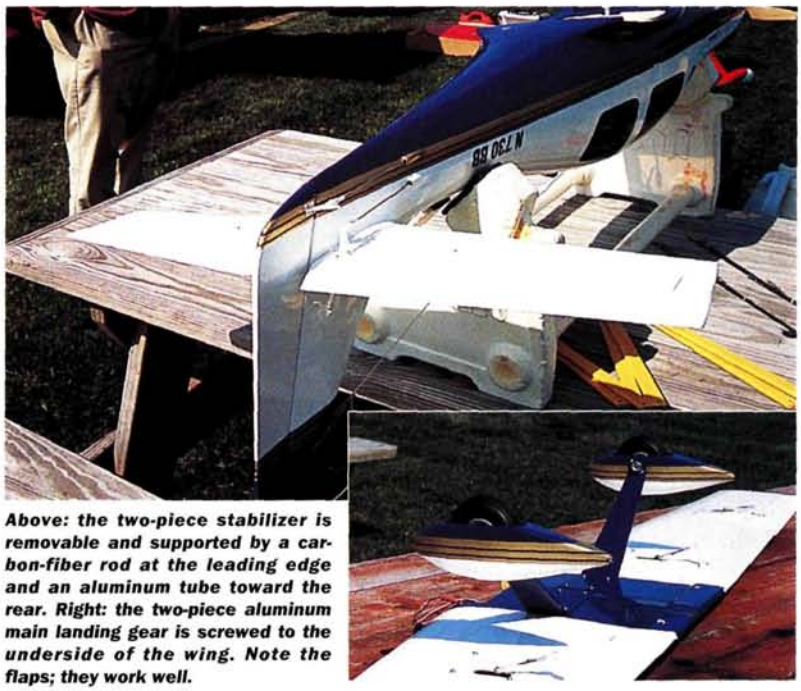
receiver antenna out through the top of the fuselage and through a piece of fuel tubing to prevent the fiberglass fuselage from cutting the antenna. I fastened the antenna to the vertical stabilizer with a rubber band.

Cowl installation. The Lancair kit includes a plywood baffle to direct cooling air over a 2-stroke engine. The baffle is not required for a 4-stroke engine, so I added it to my scrap-wood box. When I mounted the cowl, I made the screw holes large enough to accommodate a small piece of fuel line. I insert the cowl-attaching screws through the fuel line; this helps to insulate the cowl from vibration. I added four hardwood blocks to the firewall so I could put the mounting screws further away from the edge of the cowl.

Because the engine is fully cowled, I mounted a Du-Bro Kwik-Fill valve to facilitate fueling the engine. I also cut an oval hole for the glow driver to reach the glow plug. I set up the control throws, balanced the model and was ready to go.

FINAL THOUGHTS

I have to say that the Great Planes Lancair is one model that everyone will want in their fleet; its appearance on the ground and in the air is very striking. With the .91 in the nose, it's quick and solid-flying—great attributes for any model. Although some areas of assembly require a little effort, it's well worth the time needed to get this beauty in the air. The Lancair's flight performance is nothing short of spectacular, and it will do just about any maneuver you ask of it. I'm very pleased with the Lancair and look forward to spending many hours flying it. ✈



Above: the two-piece stabilizer is removable and supported by a carbon-fiber rod at the leading edge and an aluminum tube toward the rear. Right: the two-piece aluminum main landing gear is screwed to the underside of the wing. Note the flaps; they work well.

Du-Bro Products (800) 848-9411; dubro.com.
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EX-TREME 330
EX-TREME 330

CARL GOLDBERG PRODUCTS

EX-TREME 330 ARF

EX-TRAORDINARY 3D FLIGHT

PHOTOS BY PETE HALL

by Craig Trachten

I'll admit it; I'm an adrenaline junkie. There's just something about a fully capable, 3D model performing heart-stopping maneuvers as it streaks across the sky that makes my pulse race. I've had the pleasure of building and flying several aerobats that came from Carl Goldberg Products, and I quickly learned to appreciate the high quality associated with the Goldberg name; so when the Ex-Treme 330 came to my attention, I couldn't wait to get my hands on it.

The Ex-Treme 330 really shines in the air. And because it comes just as you see it here, you can have it doing what it does best in no time at all.

SPECIFICATIONS

MODEL: Ex-Treme 330 ARF

MANUFACTURER: Carl Goldberg Products

TYPE: profile fun-fly

LENGTH: 43.5 in.

WINGSPAN: 46.5 in.

WING AREA: 744 sq. in.

WEIGHT: 87 oz.

WING LOADING: 16.84 oz./sq. ft.

ENGINE REQ'D: .32 to .46 2-stroke, or .40 to .63 4-stroke

ENGINE USED: Megatech M-46

RADIO REQ'D: 4-channel w/5 servos (elevator, rudder, throttle and ailerons)

RADIO USED: Futaba 8UAF w/3 S148 and 2 3004 servos

PROP USED: APC 11x6

FUEL USED: Wildcat 15%

PRICE: $154.99

FEATURES: balsa and lite-ply construction; iron-on covering; top-quality hardware; kit includes landing gear and fuel tank; nice set of decals.

COMMENTS: I would have to search far and wide to find an aircraft that I enjoy flying as much as I do the Ex-Treme. Its performance is excellent, and it's a great deal of fun to fly. This one is definitely a keeper.

HITS

- High-quality construction materials and hardware.
- Wrinkle-free, iron-on covering with striking color scheme.
- Excellent flight characteristics.

MISSES

- Servo-lead chase was a bit too small.

WHAT'S IN THE BOX?

The Ex-Treme 330 is an ARF in every sense of the term. The main airframe comes completely built up and beautifully covered in a striking color scheme. It consists of seven pieces that must be assembled together: a profile fuselage, wing, stabilizer, rudder, elevator and two ailerons. You'll also find landing gear, wheels, a fuel tank, a nice set of decals, an instruction manual and a fairly substantial set of hardware.

ASSEMBLY

The manual states up front that this is not an airplane for beginners. The instructions assume that you have some building experience and, therefore, do not go into great detail. That said, let the assembly begin!

Wing. Start by test-fitting the wing to the fuselage. It should fit tightly but not bind. Sand or file the opening in the fuselage to ensure a proper fit, then center the wing in the fuselage (measure to be sure), and outline the location on the wing with a felt-tip marker. Remove the wing from the fuselage, and strip the covering from the wing just inside your marked lines. The idea is to expose the wood for a good bond while keeping the edge of the covering under the fuselage to prevent it from lifting. Unfortunately, there really isn't a clean way to install this type of wing. Just be sure to have paper towels and rubbing alcohol handy to clean up any excess epoxy. When the epoxy has cured, install the ailerons with the supplied CA hinges.

Tail pieces. The horizontal and vertical stabs are both attached in a similar manner to the wing's. Make sure that everything is lined up and square before the epoxy cures. Attach the elevator to the horizontal stab, install the tailwheel bracket, and then attach the rudder. Use four CA hinges to attach each aileron, and make sure that the tip of the aileron is flush with the end of the wing.

The Megatech M-46 is a great power choice for this plane. To achieve balance, I had to mount the engine as far forward as possible.

Servo installation. Install one aileron servo and the throttle servo in the right wing half; the left wing half holds the second aileron servo. You will probably have to enlarge the trays slightly to accommodate standard-size servos. Attach the control horns to the ailerons, cut a small slot just behind the hatches for the control-rod exits, and then install the aileron control rods.

I mounted the rudder and elevator servos on the side of the fuselage just in front of the control surfaces. This setup presented me with a bit of a balancing problem, but it was easily solved. Another problem was that the supplied wire chase for the servo leads was a bit too small. I had to use servo extensions, but the servo ends wouldn't fit through the chase. Because I did not want the servo wires to be bunched up, I cut a slot in the back side of the chase to allow the connectors to be placed inside. For a nice, clean look, secure the chase to the side of the fuselage.

FLIGHT PERFORMANCE

A .46-size engine spinning an 11x6 prop is my favorite 2-stroke combination, and the Megatech M-46 with an APC 11x6 prop was no exception. It spooled up fast and supplied more than enough power to put the Ex-Treme (and me) through the paces.

TAKEOFF AND LANDING

This plane just wants to fly. When you hit the throttle, the Ex-Treme jumps off the ground faster than a scared cat. Slowly add throttle, and the aircraft rolls out and rotates like any tail-dragger trainer.

Landings were my favorite part of the flight. The landing gear is capable of withstanding some hard landings. Conventional landings were a breeze; I had the most fun attempting almost vertical, helicopter-type landings. In a slight headwind and with some throttle control, you can hold the aircraft aloft with almost no forward movement.

LOW-SPEED PERFORMANCE

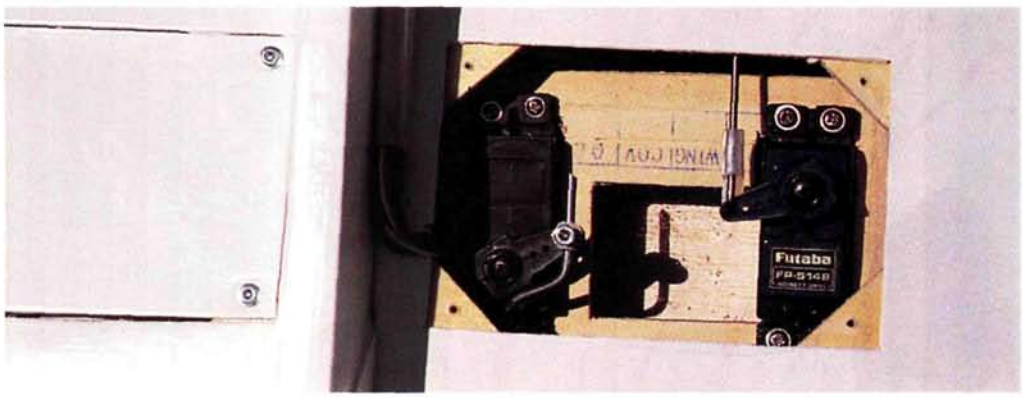
The Ex-Treme was designed for slow and stable, aerobatic flight, and it performs just as it's supposed to. Slow-speed flight and maneuvers are flawless.

HIGH-SPEED PERFORMANCE

I made one high-speed, level pass to check for flutter and found none. The Ex-Treme was not designed for high-speed flight, and it is not recommended that you attempt it.

AEROBATICS

This is where the Ex-Treme really shines. It can loop, roll, snap and perform just about any maneuver you come up with. The manual includes a step-by-step guide on how to perform some really neat aerobatic maneuvers. These will definitely eliminate that "same old, same old" feeling.



The right wing half holds the aileron and throttle servos (a second aileron servo is in the left wing half). You may have to enlarge the servo trays to accommodate the standard-size servos.

The elevator and rudder servos are mounted on the side of the fuselage just in front of the control surfaces. This may present a bit of a balancing problem, but it can be easily solved.

Engine installation. Before you install the engine, it's a good idea to check the balance. I chose a Megatech M-46 with a Mac's tuned muffler. Following the instructions, I mounted the engine with the thrust washer ¼ inch in front of the fuselage, but this made the aircraft tail-heavy. I removed the engine-mounting bolts, put the aircraft on my balancer and began to slide the engine slowly forward to compensate. In the end, I had to move the engine as far forward as it would go, use a Great Planes heavy prop hub and add an additional 4 ounces of nose weight to balance the model.

Toward the end of the manual, the manufacturer suggests an alternate throttle-servo installation method in which a microservo is mounted just behind the engine rather than in the wing. This method may eliminate the need to add a heavy prop hub.

FINAL ASSEMBLY

The final steps are to mount the landing gear and the fuel tank. Through-bolts and locknuts hold the landing gear to the fuselage. Doublers on the fuselage strengthen the mounting area by making it three layers thick, and this stood up to more than one hard landing. The fuel tank is mounted on the left side of the fuselage with zip-ties. Don't forget to put a piece of foam between the tank and the fuselage before you secure it into place.

CONCLUSION

The Ex-Treme 330 was a pleasure to assemble, but I knew that this plane would really prove itself in the air. I could not have been more right. The Ex-Treme performs flawlessly and is a lot of fun to fly. This one is definitely a keeper. ✈

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

Carl Goldberg Products *(678) 450-0085; carlgoldbergproducts.com.*

Futaba Corp. of America; *distributed by Great Planes Model Distributors Co. (217) 398-6300; (800) 682-8948; futaba-rc.com.*

Megatech Intl. *(201) 662-2800; megatech.com.*

Wildcat Fuels *(859) 885-5619; orders only (888) 815-7575; wildcatfuel.com.*

by Dave Garwood

PHOTOS BY DAVE GARWOOD

Fast-build slope soarer

Windrider Aviation is a relative newcomer to the U.S. RC plane market, but it sets a new standard for completeness in expanded-polypropylene (EPP) slope sailplanes with its EPP Bee model. Although the Bee is well suited to less experienced slope pilots who may be ready for an aerobatic plane, it's also quick and agile enough to keep experienced pilots entertained. EPP foam doesn't break; even if crushed on a hard landing, it will go right back to its original shape.

All necessary parts and materials (and more) are included, and the Bee can be assembled and ready to fly in 2 hours or less, as it doesn't need glue. The total project cost (without radio) is $50 plus shipping. I found that ordering the kit from Hong Kong over the Internet worked well, and order fulfillment was accurate and timely.

WINDRIDER AVIATION EPP BEE

Above: the exceptionally complete kit contains the basic components of molded EPP foam wing halves, balsa ailerons, precut winglets and control linkages along with filament tape, color finishing tape, component hatch covers and two types of whistles.

KIT CONTENTS

The exceptionally complete kit contains the expected basics of molded EPP foam wing halves, sanded balsa elevons, precut wingtip vertical fins, complete control linkages and a five-page building instruction booklet with 10 photographs. The translated intructions are at times difficult to understand, but the photos show how the wing goes together. The kit goes beyond the basics by including the unexpected extras of filament tape, color finishing tape and precut component hatch covers. In addition to the airframe parts and finishing materials, the kit includes two types of whistles and three decorative stickers.

To build it, you'll need scissors and sharp razor blades to cut and trim tape, a medium Phillips screwdriver for servo arms, a small Phillips screwdriver for control-horn screws, a 5⁄64-inch drill to enlarge the servo-arm hole to accommodate the control-linkage wires, and a small saw to cut off the unneeded servo-control arms.

RADIO SELECTION

A flying wing combines the functions of elevator and ailerons into one pair of control surfaces, so you'll need a transmitter that mixes these functions. I used a single-stick Hitec Focus III SS transmitter, a pair of Futaba S3004 servos and a JR 600mAh flat battery pack. I used a Hitec HAS-2MB 2-channel receiver, but, of course, the Hitec HAS-3MB 3-channel receiver that comes with the Focus III would work as well. I exchanged the servo leads to shorten the wires and allow the Futaba servos to be plugged into the Hitec receiver.

There is plenty of space in the molded pockets in the wing halves to install this equipment, and the layout is shown clearly on the photos in the instruction booklet.

ASSEMBLY

Windrider Aviation specifies that the EPP Bee can be built in 1½ to 2 hours and that no glue is required. I believe both claims are true, but I did use a little Goop glue on my Bee to strengthen and make aligning the wing-halves joint easier, to secure the servos and to fit the hatch covers. Here are the steps to build an EPP Bee in three evenings:

On the first night, read through the instructions, then glue the wing halves together with Goop. Take care to align them accurately, and temporarily apply masking tape to hold them in position. Let the glue cure overnight.

On the next evening, remove the masking tape, apply filament tape as directed and trial-fit the servos, receiver and battery pack. The battery compartment needed a little trimming to accept the specified 4 AA cells and a little shimming for the receiver to fit snugly, but the Futaba S3004 servos fit perfectly. I ground away some foam at the upper side of one molded servo compartment to allow the servo arms to extend the same distance above the wing's top surface.

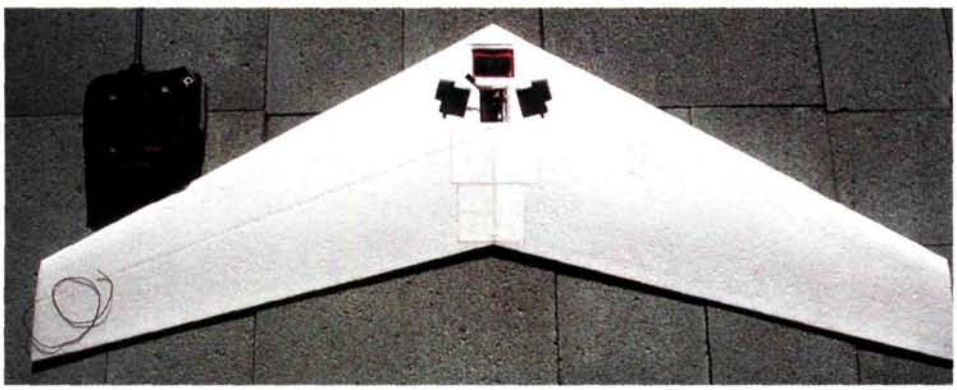
You'll need fairly long servo arms for this installation. Center the trim levers on the transmitter, trial-fit the servo arms to get one arm nearly perpendicular to the servo case, then cut off the other three arms of each. Check the fit of the control-wire Z-bend in the servo-arm holes and enlarge the holes, if necessary. I drilled them out to 5⁄64-inch diameter to get my control wires to fit.

Cut a ¼-inch-deep slit from the receiver compartment to a wingtip, and insert the receiver antenna into this slot with a Popsicle stick or similar tool. Leave the excess antenna wire coiled up inside the receiver compartment (not hanging out at the wingtip, the way I did).

Make sure that the radio mixing works before you glue the radio gear into place. Forward and back stick movement needs to impart down- and up-elevator movement, and side-to-side stick movement must impart opposite aileron movement (one up, one down). I installed the servos with a smear of Goop to hold them securely in place. The battery pack and receiver are held in place with the provided corrugated plastic material and then covered with filament tape. I used Goop again to secure the hatches and let them cure overnight. Be sure to leave a hole or a small hinged door in the receiver compartment hatch to charge the battery and to plug it into the receiver when ready to fly.

On the third night, apply filament tape to the wing according to the instructions. Work carefully to apply the tape smoothly, as wrinkles will add drag and slow the plane in flight. The strapping tape is important to airframe integrity; remember that the foam gives the wing shape, and the filament tape gives it strength and some stiffness. Strapping tape also acts as a hinge for the ailerons. The proper hinge gap is important: too tight, and control-surface movement is restricted; too loose, and the hinge is sloppy. Try for about a 1⁄16-inch gap at the top hinging surface, and allow the bottom hinging tape to come into contact with the top tape for a strong hinge.

Decorate the top and bottom of the wing with the two rolls of colored tape provided in the kit. Putting a light color on the top side of the wing and a dark color on the underside makes the plane easiest to see. Purple and red came in my kit, and I bought a third roll of yellow tape to have a light color on top of the wing. Might as well use your creativity and decorate your plane distinctively. If you make a mistake, just peel the tape off



Onboard radio components trial-fitted into place. This is the time to make sure that your radio gear is working as expected because these components will be covered up. Notice on the left the slit that contains the radio antenna. The Hitec Focus III SS transmitter has aileron and elevator mixing.

SPECIFICATIONS

MODEL: EPP Bee

MANUFACTURER: Windrider Aviation

TYPE: slope-soaring flying wing

WINGSPAN: 48 in.

WING AREA: 510 sq. ft.

WEIGHT: 17 oz.

WING LOADING: 4.95 oz./sq. ft.

RADIO REQ'D: 2-channel w/aileron and elevator mixing and 2 servos (elevons)

RADIO USED: Hitec Focus III SS transmitter, Hitec HAS-02MB receiver and 2 Futaba S3004 servos

PRICE: $50

FEATURES: molded EPP foam construction with molded servo pockets, receiver and battery bays; stiffened with filament tape; precut hatch covers and elevators; corrugated plastic wing tiplets, three rolls of filament tape, two rolls of finishing tape, hook-and-loop fastener and two whistles.

COMMENTS: the Bee is a well-designed kit that doesn't require many tools or much time to build. The plane flies very well and is suitable for beginners as well as advanced aerobatic and slope combat pilots.

HITS

- Super-complete kit.
- Can be completely built in 2 hours.
- Great flight performance.
- Tough EPP foam construction shrugs off damage.

MISSES

- Beginner builders would benefit from more detailed instructions.
- Needs a wing-taping diagram.

FLIGHT PERFORMANCE

LAUNCH AND LANDING

Launching couldn't be simpler: hold the plane level at the center trailing edge with three fingers above, thumb and pinkie below, and give it a gentle push straight out into the lift. The Bee begins flying immediately. To land, fly an approach that ends descending on a heading into the wind, and when near the ground, gently pull back on the stick to raise the nose and slow the plane until it stalls and plops onto the ground. Alternatively, the EPP foam airframe is tough enough to survive landing in a bush.

HIGH-SPEED PERFORMANCE

Because of its light weight, which is an advantage in light lift, the Bee is not a speed demon. Pushing the nose down to gather what speed it will deliver results in smooth and crisp handling in level flight and through maneuvers. It does not get twitchy or oversensitive, even at its maximum speed.

LOW-SPEED PERFORMANCE

Pulling the nose up results in slow but controllable flight. Aileron control does not get mushy until the plane gets very slow, and elevator control stays solid right up to the end in an intentional stall. Crosswind handling isn't a problem with the Bee, even without rudder control, as most of any slope flight is flown in crosswind.

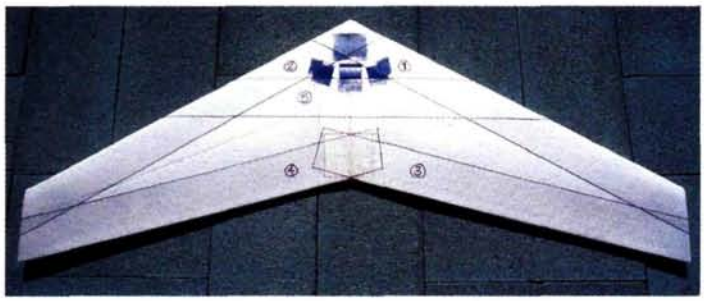
AEROBATICS

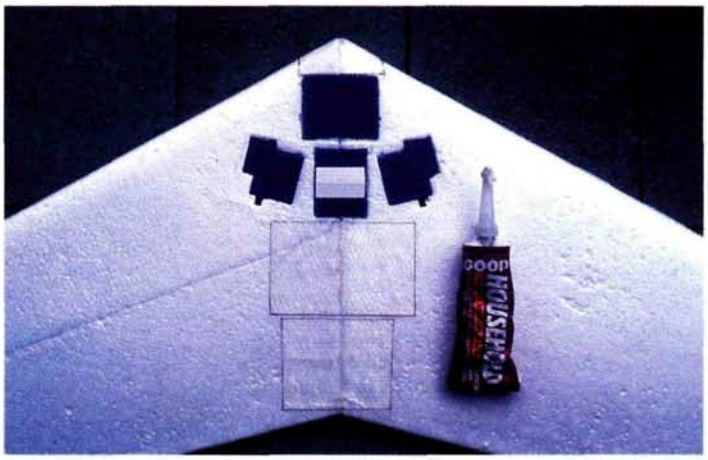
This is an agile and highly aerobatic glider. Only a little forward stick pressure is needed to hold inverted flight. Fast roll is a leisurely 3/4 roll per second, and slower rolls are possible with a little dab of forward stick when inverted. Point rolls look good. The plane will enter a spin when forced into a stall, and spin recovery is automatic by releasing the control stick. It easily performs inside loops, both large and small, and is particularly good at outside loops, including repeating outside loops. It pulls Immelmann turns, split-Ss and Cuban-8s with ease.

and apply another piece. The kit came with enough tape to cover three planes!

Install the control linkage by fitting the Z-bend ends of the control wires into the servo arms, then clipping the clevises into the control horns. To position the horns on the elevons, slide them left and right until the row of holes in the control horn are aligned over the hinge line, then install the screws and backing plates. Install the wing tiplets with the self-stick hook-and-loop fastener provided in the kit.

Last, check the center of gravity; this is very important to flight performance. The plane should balance at a point between 7.5 and 8 inches from the nose. Farther forward will make the plane more stable and docile; farther aft will make it less stable and more agile. You may need to add weight to the nose or the rear to get the plane to fly the way you want it to. Mine balanced between the specified points without adding weight—a tribute to careful design and production of this molded airframe.





Above: this is the taping layout the author used: five pieces of 3M filament tape on each of the top and bottom of the wing for stiffening and strengthening, with leading-edge strips wrapping around the leading edge for impact resistance. Right: optional strengthening modification: Goop glue works very well on both EPP parts and corrugated plastic parts and can be used to strengthen the center wing joint and toughen the radio gear hatch-cover installations. Goop should be allowed to cure overnight, so using it will lengthen assembly time.

FLYING THE EPP BEE

As good as the kit is and as smoothly as the building goes, the flight report is even better: this plane rocks! It launches easily, tracks a steady course in flight, performs commendable aerobatics and lands predictably.

Our flight testing involved two days with two pilots on coastal 60- to 80-foot hills, the first day in light, 8 to 10mph wind, and the second day in medium, 15 to 22mph wind. Though the EPP Bee launches without a hitch and is easy to fly smoothly, one thing I had to get used to compared with slope planes that have tails is that its roll control (aileron) is perhaps a little less sensitive than I expected, and its pitch control (elevator) response is more sensitive than I expected.

I think this is because although the "ailerons" have about the same area as expected, the "elevators" are about four times larger than expected. You could adjust this using a computer transmitter, but I was used to it after a couple of flights. The Bee's roll rate is about 270 degrees per second, and the elevator is powerful enough to fly snappy square loops.

Climbs, dives and level flight are all smooth and confidently flown. The Bee has good inverted flight performance and will make repeat circuits flying bottom-side-up in good lift. Large and small loops are smooth and easy with little tendency to fall out to the side. The plane resists stalling, and I did not see a tip-stall in any of our 10 flights. During intentional stall tests, the Bee holds its nose up and slows way down before it stalls, and then it falls off to one side and enters a spin. Spin recovery is easy: just release the control-stick pressure, and the plane will fall a few feet and then begin to fly again on its own.

My favorite part about flying the Bee is the ease with which it does outside loops, including consecutive ones. I consider it an excellent training plane for aerobatics in general and outside loops in particular.

Given the EPP Bee's reasonable cost for an extremely complete kit, the fast build time and the excellent flight performance, I nominate it as the best new flying-wing glider of the year; it's particularly suitable for less experienced slope pilots who may be ready for an aerobatic plane and for those who appreciate a quick-building slope plane.

Futaba Corp. of America; *distributed by Great Planes Model Distributors Co. (217) 398-6300; (800) 682-8948; futaba-rc.com.*

Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*

JR; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

Windrider Aviation; *sales@windrider.com.hk; windrider.com.hk.*

Mini Fokker D-VII

.20-size WW I biplane with big appeal!

Story & photos by John Tanzer

In April 2003, *Model Airplane News* published an article and a plan for my .20-size Sopwith Camel. I thoroughly enjoy the way these smaller biplanes fly, so I came up with a companion for the Camel in the form of the infamous Fokker D-VII—my favorite German WW I fighter. Designed around the Magnum .30 4-stroke engine, this little bipe has a 38-inch span with a flat-bottom airfoil for easy wing construction. After years of flying giant-scale, I really appreciate the ease and convenience of airplanes that can be stored and transported fully assembled. These two dogfighting favorites are truly no-hassle modeling at its best!

CONSTRUCTION

Wings. Both wings are built flat on the work surface; you can stack-cut the ribs out of 1/16-inch balsa sheet. Remember to cut holes in the top ribs for the aileron-servo extensions. Cut the trailing edge out of a single piece of 1/8-inch balsa sheet. Pin down the 1/8x3/16-inch spruce spar on the plan. Use a rib as a guide to position the trailing edge and pin it down.

Now glue all the ribs into place. The lower wing has two, 1/4-inch-thick ribs in the center. Glue in the top spars and the 1/4-inch-square balsa leading edge. Glue the 3/8-inch balsa strut-mounting blocks into their proper places. Remove the wings from the building board, and glue in the 1/16-inch balsa vertical-grain webs. Now cut the ailerons out of the top wing, and face the openings and the front of the ailerons with 3/32-inch balsa sheet. Add 1/4-inch balsa doublers to the aileron tips. Glue soft balsa blocks to the wingtips and then sand them to shape. Install the aileron servos; I used BP-102BB microservos. This finishes the wings for now.

Fuselage. Before you start the fuselage, make 3/16-inch, laminated-balsa plywood. You'll need three sheets of light 1/16-inch balsa; cut one sheet into 4-inch squares. Lay wax paper on a flat work surface; lay out the bottom balsa sheet and the 4-inch squares, and spray them with 3M Super 77 adhesive. Keeping the joints tight, stick the 4-inch squares to the bottom sheet (cross-grain). Now add the top sheet, having sprayed it and the cross-grain sheet with 3M adhesive. Press the top sheet on firmly, and let the balsa lamination dry overnight before you cut out the parts.

Cut the fuselage side pieces and formers out of the balsa ply. The sides are built on the plan with 3/16-inch-square longerons, uprights and diagonals. Build the second side on top of the first. When you've finished the sides, cut the engine mount, the bulkhead and the wing-bolt plate out of 1/8-inch aircraft plywood. Make two, 1/4-inch-plywood landing-gear mounts. Cut the 3/16-inch-square balsa crosspieces, and pin them to the top view of the plan. Insert the engine mount and the bulkhead into the slots at the front of the fuselage, invert the fuselage over the crosspieces, and pin it down.

The Magnum .30 4-stroke engine runs very well, but it needs a starter to get it going. After a complete break-in, you should be able to hand-start it; time will tell. I use an 11x4 APC propeller; it pulls well and allows the Fokker to slow down for landing.

TAKEOFF AND LANDING

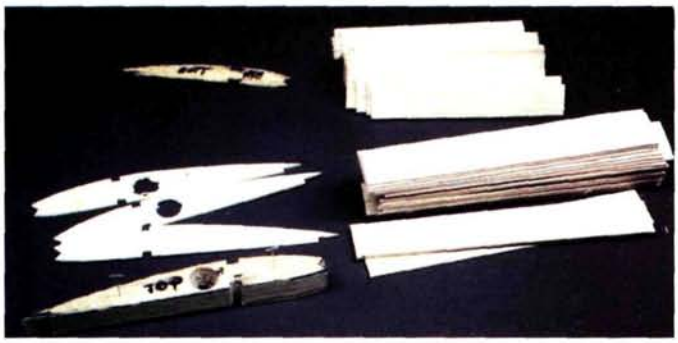
Our club holds a building contest every spring, and one of the rules is that each model must take off and make a 360-degree turn and a controlled landing on the field. The contest takes place on our opening day in May. After the static judging, I needed to test-fly the little Fokker to qualify. That day, it was too windy to take a trim flight, and I was worried that the Fokker would crash. My fears were groundless, though; I taxied out, turned into the wind (thanks to the steerable tailskid), gave it the throttle, and it was airborne after about 15 feet. I made the required 360-degree turn, turned back into the wind and made a good landing. Everyone was surprised that the little Fokker had handled the wind so well on its first flight. Even without a trim flight, it flew well. I knew I had a winner.

GENERAL FLIGHT CHARACTERISTICS

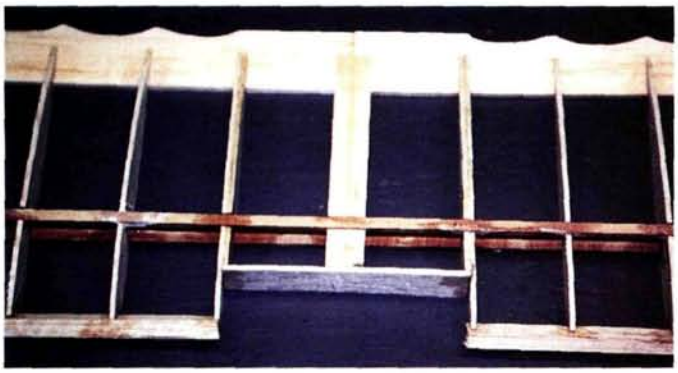
The Fokker D-VII's ground handling is very good owing to its wider landing gear and steerable tailskid. Takeoffs and landings are easily accomplished. I use differential on the ailerons, and I couple the rudder for very scale-like turns. With the enlarged ailerons, the roll rate is quite fast. I find the Fokker a delight to fly; it draws attention wherever I go.

AEROBATICS

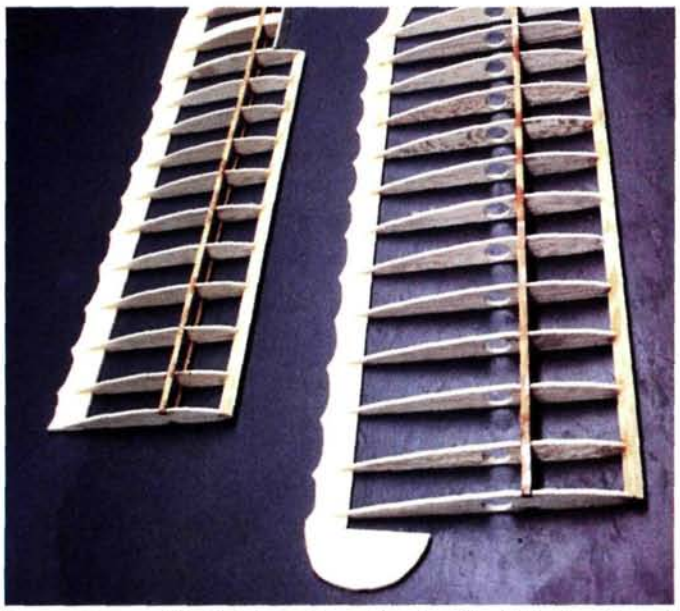
The Fokker D-VII can do all of the WW I maneuvers such as loops, rolls, wingovers, Immelmanns, chandelles and spins. It will fly inverted and can even do knife-edge flight, but I like the low, slow flybys best.



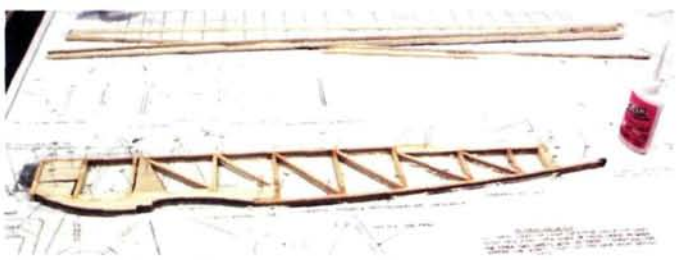
Begin construction by cutting out all of the wing ribs. Stack the balsa blanks, and use the rib patterns to form the ribs. Note the holes cut in the ribs for the aileron-servo wires.



The bottom wing has a recess to accommodate the landing-gear struts. The leading edges are simply ¼-inch-square balsa sticks.



Here are the completed wings. Built over the plans, the flat-bottom ribs and spars are easily assembled to form the basic wing structure. Note that the aileron counterbalance tab is made as part of the trailing-edge sheeting.



To ensure that the sides are identical, build the second side directly over the first. Place clear plastic wrap between the two to prevent them from being glued together.

SPECIFICATIONS

MODEL: Mini Fokker D-VII

TYPE: sport-scale biplane

WINGSPAN: 38 in.

LENGTH: 28 in.

WEIGHT: 45 oz.

WING AREA: 425 sq. in.

WING LOADING: 16 oz./sq. ft.

AIRFOIL: flat-bottom

RADIO REQ'D: 4 channels (rudder, elevator, ailerons, throttle)

ENGINE REQ'D: .10 to .15 2-stroke, .25 to .30 4-stroke

ENGINE USED: Magnum .30 4-stroke

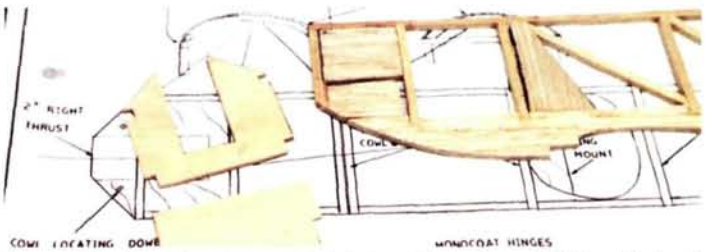
COMMENTS: this Mini Fokker D-VII is fun to build and fly. The Magnum .30 4-stroke is a fine engine that fits inside the cowl very well; only the valve cover and the muffler are visible. The model doesn't use a firewall, and with the upper fuselage formers cut out and the last bay at the bottom rear of the fuselage left open, airflow past the engine and out through the cockpit and rear of the fuselage is very good. So far, the engine has not overheated.

Glue in the landing-gear mounts, the wing-bolt plate and the 3/16 x ½-inch balsa crosspiece at the rear of the wing saddle. Use CA on all of the joints, and make sure that the sides are square. Pull the rears of the fuselage sides together, and glue in the bottom crosspieces.

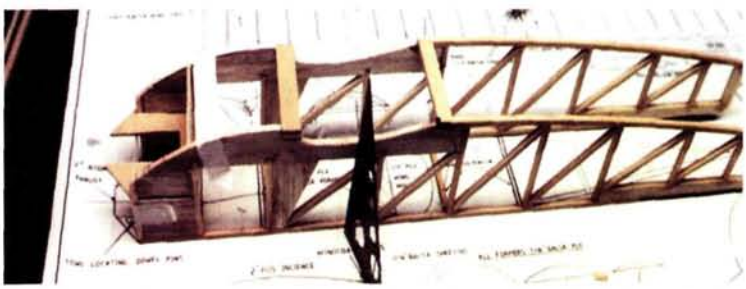
While the fuselage is still inverted on a level work surface, trial-fit the lower wing. Check that the wing is level by measuring from the work surface to the wingtips. Use a Robart Incidence Meter to check the wing for 0 degrees' incidence. Sand the wing saddle, and then drill an ⅛-inch hole in the leading edge and install an ⅛-inch dowel. Glue the 1/32-inch-ply wing-bolt plate to the rear of the wing. Place the wing back in the saddle, and check its alignment by measuring from each wingtip back to the tail (the sides should be the same length). Drill the wing, and tap the bolt plate for a 10-32 plastic bolt. Remove the wing, and harden the bolt threads with CA. Remove the fuselage from the plan, and cut the deck and cowl formers out of 3/16-inch balsa ply. Glue the formers to the fuselage top forward to the cowl separation point, and then sheet the top with 1/16-inch balsa. Sheet between the landing-gear mounts, and fill in the lower front with balsa blocks. Next, make the upper cowl, and sheet it with 1/16-inch balsa. Make the radiator out of balsa blocks, and glue it to the upper cowl. An aluminum screen is fitted into the radiator. The cowl and radiator are removable and are keyed with ⅛-inch dowel pins.

For flight, pull a rubber band over the rear of the cowl to keep it in place. Glue the 1/64-inch-ply side panels onto both sides. Mark and drill 1/16-inch pilot holes for the cabane struts where indicated on the plans.

Struts. Make the two inter-plane struts out of ⅛x¼-inch spruce. Use the diagram on the plan, as they must be made accurately; they will set the location of the top wing. Be sure to make a left and a right. Cut slits in the ends, and glue in sheet-tin angle brackets. After you've shaped the



Here are the plywood engine-mounting plate and lower forward bulkhead before installation. They fit into the slots shown, and they help to hold the two sides in alignment.



Assemble the fuselage sides and crosspieces with the structure inverted and placed over the fuselage top view.

struts, wrap their ends with thread and saturate them with CA. Drill holes in the brackets for no. 2 socket-head screws. Drill 1/16-inch pilot holes in the balsa wing-strut blocks.

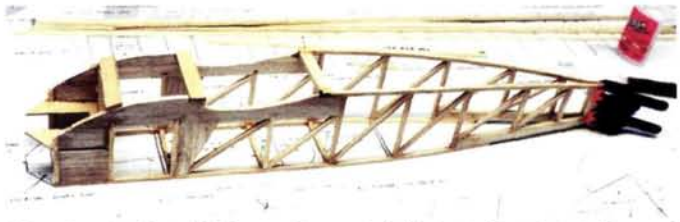
With the bottom wing in place on the fuselage and the outer struts mounted, fit the top wing into place and screw it to the outer struts. If the struts were made accurately, the wing alignment should be right. Check the top wing for 2 degrees of positive incidence, and make any adjustments that are needed. Now make the long cabane struts—one front and one rear—on both sides, using the measurements from the wing-block hole to the holes you drilled in the fuselage sides. Mount the long struts, and make the short front struts for both sides. Taper their tops to fit against the top of the front strut, and glue them into place. Remove the struts, sand them to shape, and wrap the ends and top joint with thread soaked in CA. With all the struts removed, drill out the pilot holes to 1/8 inch, cut 1/2-inch pieces of yellow inner Nyrod tubing, and glue them into all of the pilot holes with CA; these make great screw anchors.

Tail feathers. Make the stab out of 3/16-inch-square balsa and 3/16-inch balsa ply. Make the elevators, the fin and the rudder out of 3/16-inch balsa ply. Dry-fit them with Sig Easy Hinges cut in half.

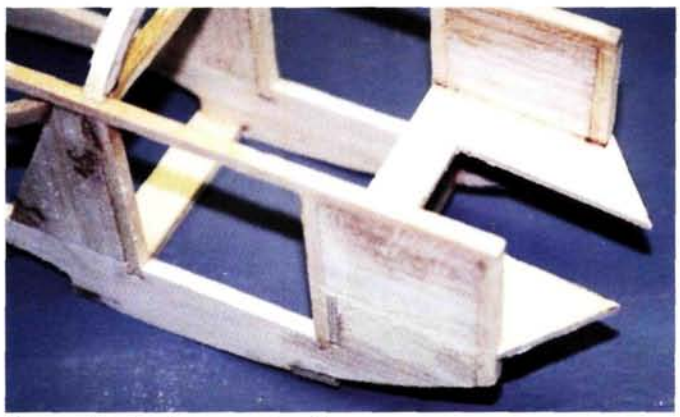
With the wings still attached, align and glue the stab and fin to the fuselage. Assemble the steerable tailskid pieces, cut a slot in the lower rear fuselage and epoxy the assembly into place. With the wings removed, trial-fit the engine and fuel tank, make the necessary holes in the cowl and install the servos, the control rods, the receiver, the battery and the switch. Keep everything as far forward as you can, and the model should balance; mine did.

Landing gear. Build the landing-gear wing flat on the work surface, just as you built the main wings. Glue shear webs onto both sides of the spars to enclose the 1/8-inch brass-tube axle. Solder 1/8-inch wheel collars to brass plates, and recess them into the 3/8-inch balsa end ribs with the collar facing in. The setscrew in the wheel collars will lock the wing into place. Drill an 1/8-inch hole all the way through the wing (drill in from both sides). Bend the landing gear out of one piece of 3/32-inch music wire with the joint at the rear. Make two brass triangles, and solder them and two, 1/8-inch wheel collars to the landing-gear yoke; these will lock the axle to the gear. Mount the landing gear on the fuselage with landing-gear straps and no. 2 socket-head screws.

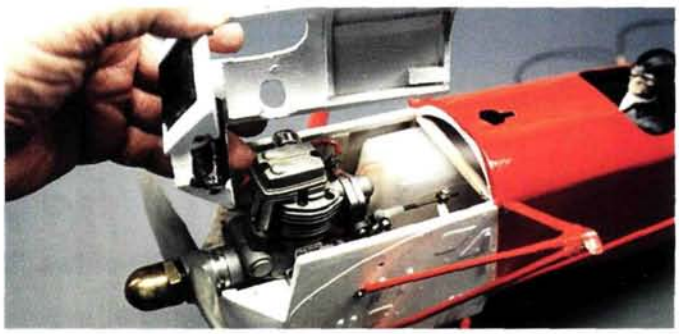
The 1/8-inch brass-tube axle has an inner axle made out of 3/32-inch-diameter music wire that is 3/8 inch shorter. This should prevent the axle from bending on a hard landing. Simultaneously slide the tube axle into the landing gear and into the wing. Lock the landing-gear wheel collar to hold the axle in place, adjust the wing for 3 degrees of positive incidence



After the glue has dried, use clamps to hold the tail ends together and install the rear crosspieces.



The completed engine compartment.



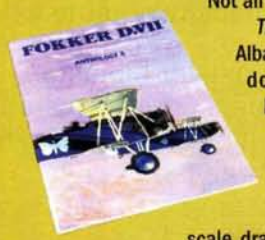
This photo shows the removable cowl; note the cabane strut mounting. The hole in the top of the deck is for the aileron servo leads.

Here, you see the cabane strut arrangement. The screw holes in the balsa have been reinforced with short lengths of yellow inner Nyrod pushrod tubing that has been "zapped" into place.

For aileron control, I used GWS microservos. One servo is used for each aileron.

COATS OF MANY COLORS

One reason why the Fokker D-VII is such a popular modeling subject is the vast array of colorful paint schemes applied to full-size fighters during WW I. Not all German biplanes were red, you know!



The Fokker D-VII Anthology published in the UK by Albatros Publications Ltd. is an excellent source of documentation regarding color and detail. Distributed in the U.S. by Wise Owl Publications, this three-book series contains perhaps the best information available to modelers who want to know everything there is to know about the D-VII. The series includes many 3-view scale drawings, detailed illustrations and several color schemes showing aircraft markings. Information on individual aircraft and factory specifications for painting and covering them is also included.

If you've ever been even just a little interested in the Fokker D-VII—or any other WW I aircraft, for that matter—Wise Owl Publications has the documentation you've been looking for. Its address is 5150 Candlewood St., Ste. 1, Lakewood, CA 90712-1900; (562) 461-7574; email info@wiseowlmagazines.com; wiseowlmagazines.com.

With the bottom wing removed, you can see the adequate fuselage space for the radio gear. Note the yellow Nyrod screw anchors in the sides for the rear cabane struts. Also note the landing gear grooves and the plastic gear straps.

To assemble the landing gear, slide the brass-tube axle into the gear assembly and the sub-wing structure at the same time. A cotter pin and washer retain the wheels.

and then lock it into place with the wheel collars. Drill the tube-axle end to accept a cotter pin and a washer; these will help retain the wheels.

For a scale look, cover the wire landing-gear legs with balsa, and sand them to shape.

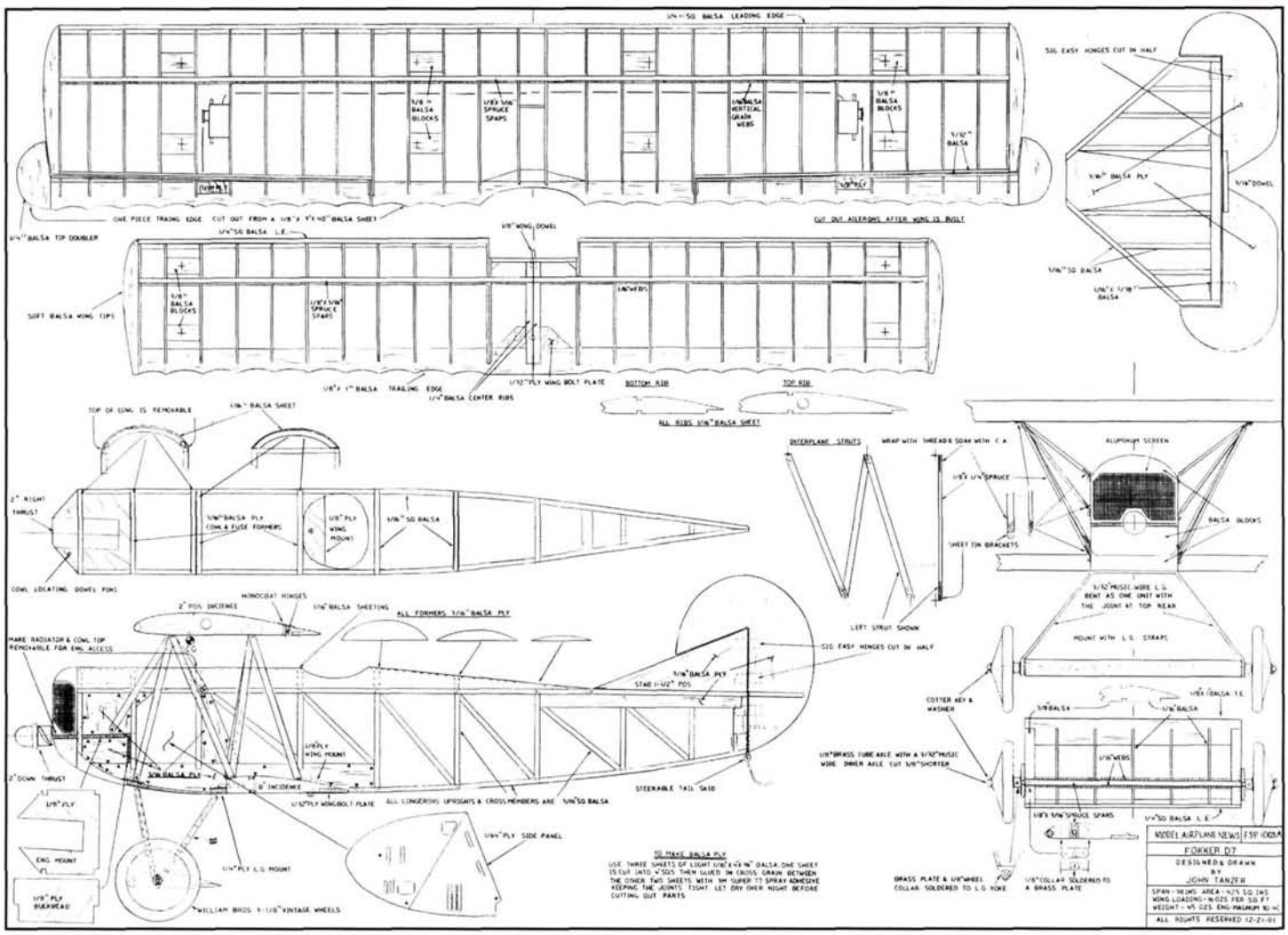
Finishing. I covered my Fokker with red MonoKote, and I also used MonoKote to hinge the ailerons—a strip on top and a strip on the bottom. I painted the wing and landing-gear struts red to match. I painted the nose white, and I covered the tail with white MonoKote. After you've covered the tail, hinge it with Sig Easy Hinges cut in half. The German crosses are hand-cut out of 2 mil vinyl bought at a sign shop.

The Mini Fokker D-VII is a ball to fly. It attracts attention wherever I fly it. Many modelers have asked me for the plan, so here it is. I had fun designing and building this model, and that's what this hobby is all about. I want you to have fun, too, so send for a set of plans, build a D-VII and join me over the trenches. Happy landings!

APC Prop; distributed by Landing Products (530) 661-0399; apcprop.com.
GWS; distributed by Balsa Products (732) 634-6131; balsapr.com; Horizon Hobby Inc. (800) 338-4639; horizonhobby.com; and Maxx Products Intl. (847) 438-2233; maxxprod.com; gws.com.tw.
Magnum; distributed by Global Hobby (714) 963-0329; globalhobby.com.
MonoKote; distributed by Great Planes Model Distributors Co.; (217) 398-6300; (800) 682-8948; greatplanes.com.
Nyrod; distributed by Sullivan Products (410) 732-3500; sullivanproducts.com.
Robart Mfg. (630) 584-7616; robart.com.
Sig Mfg. Co. Inc. (800) 247-5008; sigmfg.com.

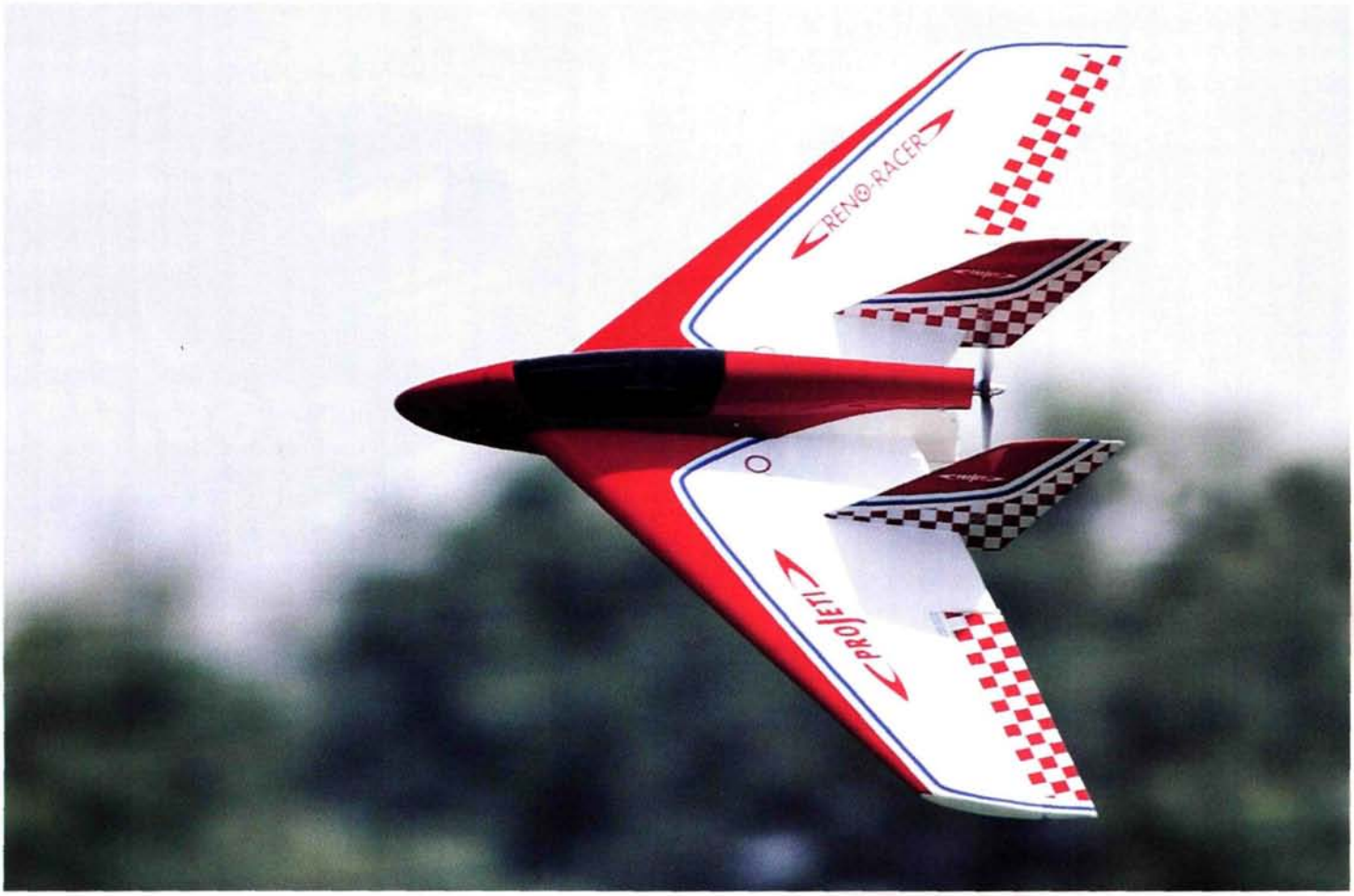
MINI FOKKER D-VII FSP1003A

Designed by John Tanzer, this mini Fokker D-VII is fun to build and fly. The model doesn't use a firewall, and with the upper fuselage formers cut out and the last bay at the bottom rear of the fuselage left open, airflow past the engine and out the cockpit and rear of the fuselage is very good.
WS: 38 in.; L: 28 in.; radio: 4-channel; power: .10 to .15 2-stroke, .25 to .30 4-stroke; 1 sheet; LD 2. **$19.95**



To order the full-size plan, turn to page 148, or go online to rcstore.com.

Projeti—not your average flying wing



Flying wings fascinate me; in addition to their performance advantages, they're just too cool for words. From unpowered slope soarers that gracefully ride air currents to high-performance wings that have great speed and aerobatic prowess, the flying wing fills many requirements. Many wings, including Hobby Lobby's sleek Kavan Projeti, make fantastic backyard flyers and can really be let loose in larger flying areas. Let's take a closer look at this versatile plane.

ABOUT THE MODEL

The Projeti uses unique construction techniques. The airframe is made of injection-molded foam and comes as one piece. The plastic nose cone and cowl that cover the pod fuselage are trimmed and painted, but the sheet-balsa vertical fins have to be final-sanded and covered with the provided vinyl stickers. Servo pockets have been molded into the wing's underside, and my Hitec HS-55 servos fit these pockets perfectly. The pockets are covered with aerodynamically shaped plastic covers to protect the servos and their linkages.

A huge adhesive decal wraps around the top and bottom of each wing panel and provides a smooth, durable finish as well as a lot of extra strength to the wing. A bonus is that the decals also act as elevon hinges.

The Projeti can be built quickly with very few tools. I built mine in my office during lunch breaks; four, one-hour sessions were all it took to get airborne.

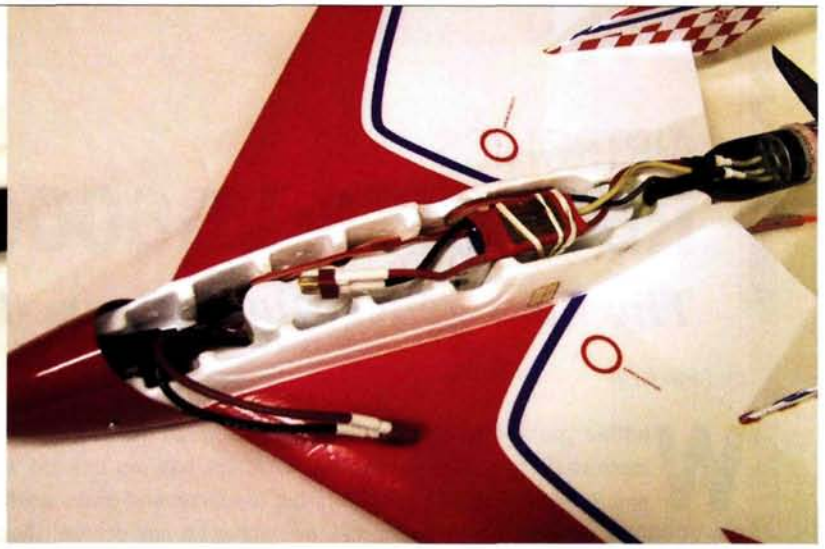
POWER REQUIREMENTS

The Projeti requires a Speed 400 6V motor and a Gunther "spoon" prop, and this combination makes it move out at a good clip. But if you want more performance, you can easily upgrade to a long-can Speed 480 motor and a Graupner Cam Speed prop. Or, for absolutely ballistic performance, do what I did: use a Mega 16/15/3 brushless motor and a Jeti JES 30-3P 30A speed control, a Graupner 5.5x4.3 Cam Speed prop and an 8-cell, 1300mAh Ni-Cd (a 1700mAh NiMH battery would be just as good). Even with this hot setup, the Projeti can still be slowed down enough to be comfortably flown in a baseball field.

FASTEN YOUR SEATBELTS!

After a thorough preflight check, the Projeti was ready for its first flight. Unique features are the start-position wedges that are

The Mega 16/15/3 brushless motor, Jeti JES 30-3p ESC and Graupner Cam Speed prop make a potent combination.



All of the radio equipment is inside the fuselage pod.

molded inboard of the elevons on each wing panel and are the keys to successful hand-launching. Before launching the Projeti, angle the elevons upward to match each wedge's top surface. This will consistently provide a little up-elevon so that the model doesn't sink when you launch it. My JR 8103 radio has landing-configuration programming, and I programmed in up-elevon to match the wedges. Now, to correctly set the elevons before launching, I need only to flick a switch.

I applied full throttle and tossed the Projeti, but I didn't quite expect what happened next. After a second or so, it was quickly climbing out of sight at a 50-degree angle! I flicked off the launch trim and went to ¼ throttle to slow it down and bring it back into sight. After a couple of trim passes, I applied full throttle and watched in amazement as the Projeti literally leapt forward. With its high power-to-weight ratio, it's a real speed demon, and it tracks like an arrow.

We checked its flight speed with a radar gun and got readings of from 55 to 65mph—not too shabby for a 32-inch-span foam model!

But the real surprise came when I throttled back. For relaxed backyard flying, the Projeti is right at home when cruising around at ¼ throttle. It will turn tightly and doesn't fall out of the sky—great for building confidence in low-time pilots. When flown more slowly, the flight times are extended (we all like this!).

I tried several aerobatic maneuvers and found the Projeti well suited to any that don't require rudder control. Loops can be as large or as small as you want, and rolls are ... well ... on high control rates, faster than you can blink! The Projeti flies inverted very well and needs only a little down-elevator to hold level flight. The large vertical fins really help with pilot orientation while it's inverted. Amazingly, the Projeti will do low-speed aerobatics for tons of backyard fun. It definitely isn't your average backyard flyer!

CONCLUSION

The Kavan Projeti is an outstanding flying wing! With its short building time, sharp looks and wide flight envelope, it makes an ideal backyard flyer. If you power it with a Speed 400 motor, you'll have the sort of exciting speed and maneuverability that can be accommodated in a baseball field. If you go with a brushless motor system, you'll have the best of both worlds: backyard performance and ballistic speeds. Have fun with your Projeti! ✈

Graupner; *distributed by Hobby Lobby Intl.*
Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*
Hobby Lobby Intl. *(615) 373-1444; hobby-lobby.com.*
JR; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*
Kavan; *distributed by Hobby Lobby Intl.*
Mega; *distributed by Hobby Lobby Intl*

click trip MODELAIRPLANENEWS.COM **SEE VIDEO OF THE PROJETI IN ACTION**

SPECIFICATIONS

MODEL: Projeti
MANUFACTURER: Kavan
DISTRIBUTOR: Hobby Lobby
WINGSPAN: 32 in.
WEIGHT: 24 oz.
RADIO REQ'D: 3-channel with elevon mixing, 2 microservos and mini-receiver
RADIO USED: JR 8103 transmitter w/R610M micro-receiver and 2 Hitec HS-55 microservos
DRIVE SYSTEM USED: Mega 16/15/3 brushless motor w/Jeti JES 30-3p ESC and Graupner 5.5x4.3 Cam Speed prop
BATTERY USED: 8-cell, 1300mAh Ni-Cd
FLIGHT DURATION: 8 to 10 min.
PRICE: $99

AIRTRONICS
RD8000 & VG6000

The next generation of easy-to-program computer radios

by John Reid

Whether you're interested in buying a new, high-end computer radio or one that's more basic (and less expensive), Airtronics has you covered with its new VG6000 and RD8000. The VG6000 offers the functions and mixes needed for most planes. The VG6000's up-front programming has everything on one screen, thereby eliminating the need for pilots who are programming novices to learn complicated menu structures (see the sidebar, "Airtronics RD8000 rotary roundup"). For pilots who want to expand into competition flying, the RD8000 offers an easy-to-follow menu structure with a large assortment of functions and mixes for every type of flying. So many options are available that this could be the last radio you'll ever need to buy.

RD8000 MAXIMUM PERFORMANCE

The RD8000 is the successor to the very successful RD6000 Sport and Super radios. Offering more features, more model memory and the new 92778Z 8-channel FM receiver, it was developed for use with aircraft (both powered and sailplane) and helicopters and is available in both 72 and 75MHz.

In addition to its 8 channels, the RD8000 has a 10-model memory that can store any combination of fixed-wing planes and helicopter programming. Airtronics offers the RD8000 with seven flight-pack combinations; the setup I reviewed included the new 8-channel dual conversion narrowband 92778Z receiver and five, 94322Z heavy-duty servos rated at 46 oz.-in. of torque. It has a 0.19-second/60-degree rotation speed on 4.8 volts. Also included are a rechargeable 1100mAh, 4.8V Ni-Cd battery, a dual-output battery charger, a switch harness, a servo extension and mounting hardware with an assortment of servo arms, a frequency flag and a very detailed, 79-page operation manual.

FEATURES

The transmitter has two dual-axis control sticks, the length and tension of which may be adjusted to suit your hand. The digital trim levers beep for each trim movement, and the amount of trim movement for each beep is set in the trim-step

The upper right corner of the transmitter has the auxiliary 2-slide switch that can be used for activating various mixes and setups. Right next to that is the slightly shorter aileron dual-rate slide switch. Use the small "THROTTLE CUT" button when you want to kill the running engine. The 3-position flap switch gives extra control by allowing flaps to be deployed at 50 and 100 percent.

menu. The liquid-crystal-display (LCD) screen shows the value and direction of each trim input.

The large LCD screen is used for all the programming. During normal operation, it displays the transmitter battery's bar graph along with the current voltage in numbers, trim-lever values and directions, model number, model type (aircraft or helicopter), model name (if entered), current transmitter voltage, transmitting modulation and whether the basic programming is on or off.

Retracts are controlled by the switch at the top left of the case. If you use Airtronics' new proportional retract servo (item no. 94739), you'll be able to control the endpoint adjustment, thereby giving precise tuning to mechanical retracts and virtually eliminating gear binding. The switch at the top right is a 3-position flap switch that allows you to control the throw for all three flap positions. All of the menu selections and adjustments are accomplished by using the eight keys at the bottom of the transmitter. You can move left, right, up, or down in the menus by pressing one of the function keys. To change the values in any menu, use the "INC+/YES" or the "DEC-/NO" buttons. Pressing the "END" key always returns you to the previous screen.

The RD8000 has a built-in warning feature that won't allow you to use the transmitter if you turn it on when the throttle stick isn't in the lowest position. This is a special safety feature for electric-powered planes that prevents accidental startup when you turn on the flight pack. The built-in training system is compatible with most of Airtronics' other radios, but to take advantage of it, you will need to purchase a trainer cord.

EXPANDABILITY

The RD8000 is a radio control system that's designed to grow as your piloting skills advance. At first, you may need only the basic menu features that are available on all channels—dual rates (aileron and elevator), servo-reversing, or center and endpoint adjustments. As your piloting skills and planes evolve, you may need more advanced functions; just turn off the basic programming menu, and you'll have a wide selection of mixes, differentials and options. If you want to try helicopters, just select "Heli" from the choices of model types, and you'll find many control features specifically for helicopter flying.

SPECIFICATIONS

MANUFACTURER: Airtronics

PRODUCT: RD8000

TYPE: 8-channel computer radio w/10-model memory

TRANSMITTER: 8-channel, dual stick (Mode II)

RECEIVER: 92778Z dual-conversion 8-channel narrowband; dimensions: 2.5x1x0.75 in.; weight: 1 oz.

SERVOS: 5, 94322 heavy-duty servos; weight: 1.59 oz.; dimensions: 1.54x0.79x1.42 in.; 46 oz.-in. torque

ACCESSORIES: 1100mAh, 4.8V Ni-Cd battery; dual-output battery charger, switch harness, servo extension, servo-mounting hardware and an assortment of servo arms; frequency flag and operation manual.

PRICE: $299.99 to $469.99 (depending on flight pack); $329.99 as tested

FEATURES: 8-channel control; 10-model memory; programmable mixes, dual-rate alarm and a large selection of mixes and functions.

COMMENTS: this is a very easy radio to program, and the manual's detailed explanations make for a very short learning curve.

HITS

- Easy to understand the instructions.
- 10-model memory.
- Two programmable mixes.
- Four transmitting modulations make it compatible with various brands of receivers.

MISSES

- None.

The upper left corner of the transmitter contains the buttons and switches for the retracts, training button, elevator dual rates and auxiliary-1 (used to activate C-mix 1 and 2). The switches are different sizes, so it's easy to find them with your fingers when you want to keep your eyes on the plane.

COMPUTER CONTROL FEATURES

With more than 86 menus to cycle through and 39 functions to choose from, it would be difficult for me to detail all the control features that are available with this radio, so I'll just cover some of the ones that I like to use.

• **Option menu.** No pilot will ever need all of the screens that are available with this radio; for example, if you don't have a delta-wing plane, you'll never need to use the delta-wing mixing screen. The option menu screen enables you to turn off unused programming screens. This means that there are fewer screens to cycle through when you need to adjust settings on the plane. If you need to use a programming screen that was turned off, use this menu to turn it back on. The option menu turns off only the screen, not the feature; any activated functions will remain active with the screen off, but you won't see that screen in the programming menu. When you've established certain setups, they may never need adjusting again. Simply turn off that screen, and you'll never have to worry about accidentally entering bad data. For example, after all of the servos have been set with the proper direction in the servo-reversing screen, turn off that screen. Now you can never accidentally reverse them as you cycle through the programming screens.

All information is input into the computer with these eight buttons. The function buttons move you through all of the menus. Increase the values within those menus by using the "INC+/YES" or "DEC-/NO" buttons appropriately. Press the "END" button to return to the previous screen. A second press on that button returns you to the home screen.

• **Flap-elevator.** This function prevents the plane from climbing when you deploy flaps and automatically adds a bit of down-elevator (depending on what you entered here) when the flaps are deployed, keeping the plane at the same rate of descent.

The new 92778Z FM dual-conversion receiver comes with the RD8000. It's the same size and weight as the 92777Z Slim-Line receiver, but the servo connections are at the end of the receiver. This feature allows you to place the receiver in a small, tight cavity without the servo leads getting in the way.

• **Dual-elevator mixing.** This is one feature I use all the time; many of my models use dual-elevator servos. This function eliminates the need for a Y-harness and gives each servo its own endpoint adjustment (EPA) and servo centering.

• **Aileron differential.** When ailerons have equal up-and-down movement (deflection), the downward aileron creates more drag than the upward aileron; this makes the plane yaw in a direction that's opposite to the aileron input—a movement that's known as "adverse yaw." This function can eliminate adverse yaw by giving more deflection to the upward-moving aileron and less to the downward-moving aileron. Aileron differential works only if your plane has separate servos for aileron control.

• **Rudder-aileron and rudder-elevator mixing.** This mixing allows the rudder-control input to simultaneously make small corrections to the aileron or elevator to prevent unwanted pitching and rolling when performing knife-edge flights. Using this mix will make your knife-edges look picture-perfect.

These are just a few of the functions that you can program into the RD8000 to make setup easier and flying more enjoyable. The manual says it best: "The RD8000 will allow you to extract the maximum performance from your aircraft while at the same time simplifying the task of setting up and adjusting your model."

RD8000 ROTARY ROUNDUP

The Airtronics RD8000 is also of great use to helicopter enthusiasts who want versatility along with practicality. A quick look at the features list reveals how much is packed into the software, while a look at the large LCD screen confirms that ease of use was a priority.

Like most other multi-task computer radios, the RD8000's programming is broken down by model type (aero and heli), and its functions are divided into two menus: basic and advanced. The basic menu includes all of the programming necessary for helis, while the advanced menu offers more extensive programming features. Four flight modes (normal, idle-up 1, idle-up 2 and throttle hold) are available, and each mode has a 5-point pitch and throttle curve that can be adjusted to suit your specific needs. Two switches on the top corners of the transmitter activate the flight modes. The left, 2-position switch controls normal mode and throttle hold; the right, 3-position switch turns on normal, idle-up 1 and idle-up 2. The throttle-hold switch has priority over any flight-mode switch position.

If you're already a heli pilot, you've probably noticed that the flight-mode switch locations are the reverse of what you're used to. Simply remove the back of the transmitter, and swap the switches to where you're accustomed to seeing them. New labels are provided to properly identify the switches.

One neat feature is the use of digital trims instead of dials for the hover pitch and hover throttle. This means that the settings will not carry over to another model as the dial settings would. If you fly multiple helicopters with one transmitter, you know how handy this feature will be. Another feature is the RD8000's ability to set two gyro gain rates in each of the four flight modes. This is useful when you want a high gain setting for hovering and a lower gain for aerobatics. To accommodate today's helicopter control systems, the RD8000 also has cyclic, collective-pitch mixing (CCPM) programming for 90- and 120-degree CCPM systems.

Airtronics has come up with a package that suits all heli pilots. The RD8000 provides four flight modes, all with 5-point curves and digital trims, and programming is logical and intuitive—great for your first computer radio. The comprehensive manual does a great job of walking you through all of the radio's functions with step-by-step instructions supplemented by drawings. The Airtronics RD8000 is a remarkable value for heli pilots. *—Rick Bell*

SPECIFICATIONS

MANUFACTURER: Airtronics

PRODUCT: VG6000

TYPE: 6-channel computer radio w/4-model memory

TRANSMITTER: 6-channel, dual sticks (Mode II)

RECEIVER: 92777Z dual-conversion 7-channel narrowband; dimensions: 2.24x0.96x0.85 in.; weight: 1 oz.

SERVOS: 4, 94102 heavy-duty standard servos; weight: 1.59 oz.; dimensions: 1.54x0.79x1.42 in.; 42 oz.-in. torque

ACCESSORIES: 600mAh, 4.8V Ni-Cd battery; a dual-output battery charger, switch harness, servo extension, servo-mounting hardware and assorted servo arms; frequency flag and operation manual.

PRICE: $179.99

FEATURES: 6-channel control; 4-model memory; programmable mixes; dual-rate and single-screen programming.

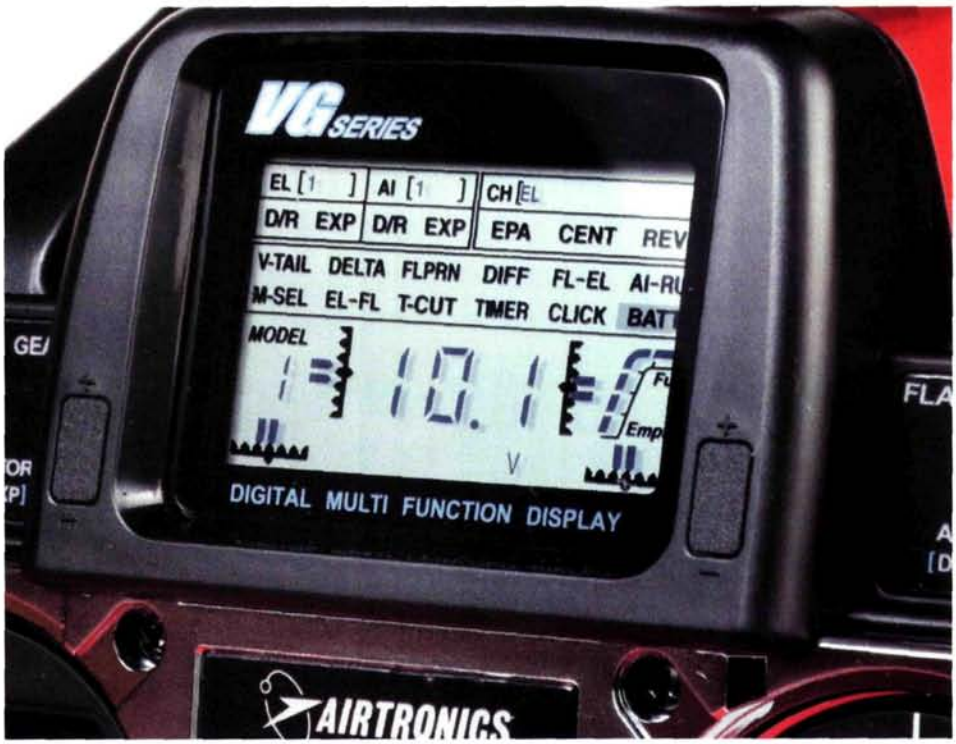
COMMENTS: the big attraction of this radio is that everything is controlled from one screen, and this makes programming very easy. The second big draw is the attractive price tag that puts it within virtually all pilots' budgets.

HITS

- Price.
- One-screen programming.
- Dual rates for elevator and ailerons are on separate slider switches.

MISSES

- None.



All of the programming for the VG6000 is accomplished from this screen. You select the desired functions on the upper half. Once highlighted, the current setting for that function is displayed at the bottom center of the screen and can be changed by using the "INC+" and "DEC-" buttons.

VG6000 ONE-SCREEN PROGRAMMING

The new VG6000 offers computer digital performance without requiring you to scroll through complicated menus and computer programming. Every control function is constantly visible on the large LCD, and that makes this radio very easy to operate. The radio's design helps you to painlessly make the transition from an analog system to a computer system because all the control settings and mixing are simple to understand and execute.

All of the screen selections are made using these five buttons. The two "FUNCTION" buttons move the cursor through the various features; once highlighted, these functions can be increased and decreased in value by using the "INC+" and "DEC-" buttons. The channel selector/timer button is used to highlight one of the 6 servo channels (1 through 6).

TRANSMITTER FEATURES

The VG6000 is the perfect radio to introduce you to the world of computer-radio programming. The unit's most noticeable feature is its large LCD screen where all of the programming is done, thereby eliminating the need to learn complicated menu structures. This screen gives real-time status on the trim-tab locations, indicates model selection and gives current battery voltage with a bar-graph display. The 2-position retract toggle switch, trainer button and elevator dual-rate slide switch are on the upper left side of the case. The upper right side of the transmitter sports a 3-position flap toggle switch, a throttle-cut button and the aileron dual-rate slide switch. The transmitter has two dual-axis control sticks that are adjustable in both length and tension to fit your hand. The four digital trim levers beep for each click of adjustment, along with an updated LCD display of the corresponding movement.

Five buttons near the bottom of the transmitter control all computer-data entry. Two function buttons move the cursor through the various features by highlighting each on the LCD screen. Once highlighted, those functions can be increased and decreased in value by using

the "INC+" and "DEC-" buttons. The channel selector/timer button is used to highlight one of the 6 servo channels (1 through 6). This allows you to choose the functions that are available on all channels—endpoint adjustment, servo centering and servo-reversing.

PROGRAM FEATURES

The VG6000 has a 4-model memory that stores all of the control settings for every model. The elevator and aileron dual rates and exponential are also saved along with the timer, throttle cut and any mixing setting for that plane.

MIXING

The VG6000 has seven predefined servo mixes that can make it a snap to set up and fly unusual aircraft designs. V-tail mixing combines the rudder and elevator movement so that both the right and left V-tail servos perform both functions. Because delta wings lack a tail, the delta-wing mix combines the elevator and aileron control for both the left and right wings' ailerons. The flaperons mix allows any plane's ailerons to do double-duty as both ailerons and flaps. If your plane has flaps, try flap-to-elevator mixing. This automatically feeds in down-elevator when you activate the flaps and results in a smooth, level descent on landing. The elevator-to-flap mixing works in the opposite way by feeding in flaps when elevator input is applied. On some planes, this extra lift during turns and landings can prove to be really beneficial. Another useful mixing function is the aileron-to-rudder mix that can improve the turning ability of some high-wing aircraft by coupling rudder with aileron input.

The 2-position retract toggle switch is on the upper left of the case. To transfer control to another transmitter that's connected by the Airtronics training cord, you press and hold the "TRAINER" button. A separate slide switch controls the elevator dual rates. The high rates can be programmed on position 1 or 2 (up or down) on the slide switch.

The control features and mixes that come standard on the VG6000 make it an excellent value. At $179.99, this radio system is a real steal. If you've ever wanted to upgrade from an analog system to the more precise control of a computerized system, there has never been a better time to do so.

FINAL THOUGHTS

These new offerings from Airtronics cover all the bases. Whether you want to move up to a computer radio without spending a lot, or you want an easy-to-learn format, take a look at the VG6000. Need a radio with all the bells and whistles that has functions capable of handling even the most advanced flying needs? Then the RD8000 could be the radio value you're looking for. Either way, these Airtronics radios are worth a close look.

Airtronics Inc. (714) 978-1895; airtronics.net.

The aileron dual-rate slide switch is on the upper right of the transmitter along with the throttle cut and the 3-position flap toggle switch. Having various types of buttons makes them easy to "read" with your fingers when you're flying.

The ultimate in easy repairs

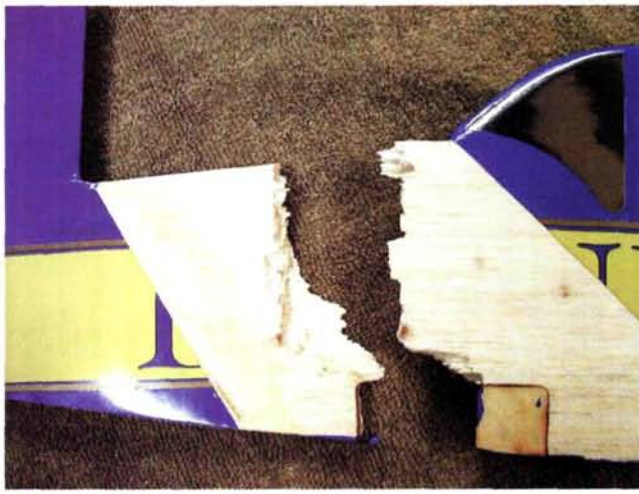
Try this strong, light technique

by Steve Woodrough

So many articles detail all sorts of methods to create a model; this one details and documents a fairly major repair. I hope that it will inspire those with limited building experience to repair their models rather than just trash them. Last flying season, I was practicing inverted flat spins with my Sig Ultimate Bipe (my favorite plane), and the engine flamed out. Without power, it descended evenly but steeply and, needless to say, I did not quite reach the runway. When I picked up the Ultimate, my heart sank; the plane had landed hard enough to break the fuselage in two. It was a long, quiet ride home.

The next day, I cleaned the model and thought about rebuilding it. New decals, covering and glue didn't amount to much expense, but I cringed when I considered all the time it would take. I decided there had to be a better solution.

Any good work begins with a careful assessment of the job ahead. I considered four options: scrap the fuselage and order, build and cover a new one; glue the two pieces together with CA and hope for the best; use dowels to align and reinforce the break (fairly complicated); or glue the joint with CA and reinforce it with plywood doublers. The last option seemed the least complicated and most likely to be successful. The following photos detail the work done to the left side of the fuselage; I used the same procedure on the right side.

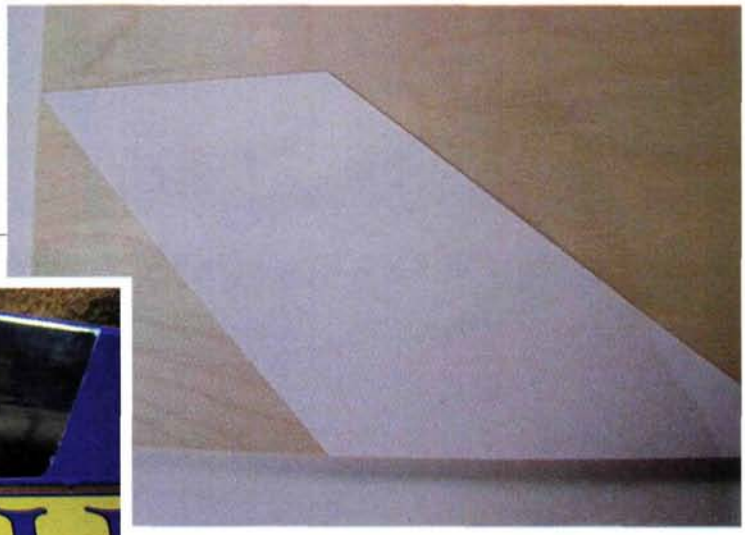


1 I decided to remove and reuse a portion of the trim sticker that runs the length of the fuselage. Also, I wanted to remove only the covering around the area of the break. On this particular model, the 1/16-inch-thick plywood sheets form an angle on both sides of the fuselage. This angle runs in roughly the same direction as the break. I made the second parallel cut several inches back and beginning at the base of the windshield.

Most of the wood on both sides of the break was attached to one side or the other. Those pieces would help me to join the halves back together. The pieces of wood that were flaking off were of no real use, so I removed them to help ensure the tightest fit possible.

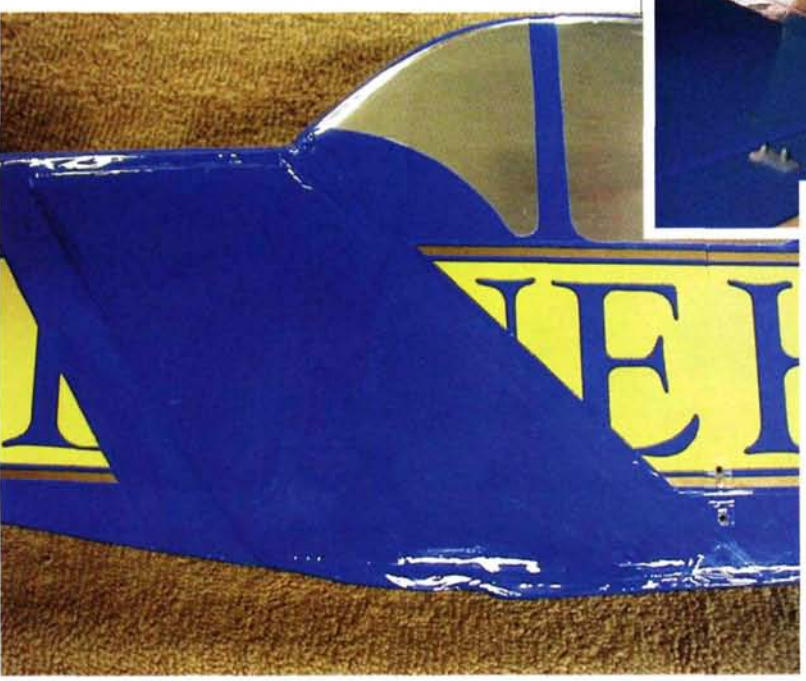
2 This step was one of the most critical because after its completion, there would be no going back. I carefully pieced the halves together, making sure that they fit as tightly as possible and were aligned. Because the front of the fuselage is thicker than the rest of the model, it would be really easy to end up with a banana if I just laid the halves on a table and glued! I added CA slowly, drop by drop, and continued to check for straightness as I went along.

3 I continued to fill in the areas where wood had flaked off until the surface was reasonably level. Before I made the plywood doublers, I cut a template of two pieces of scrap paper and laid them over the break, covering as much of the work surface as I could.



4 I transferred the template shapes to the plywood and cut them out on a jigsaw. To help smooth out the transition, I feathered the top surface of the doublers with a palm sander. I epoxied them into place so that I would have time to recheck the alignment and adjust it as needed. As the epoxy set, I used as many clamps as I could to ensure that all the excess epoxy was squeezed out. After the epoxy had fully cured, I removed the clamps, and the surface was ready for covering.

5 From this point, the job became like any other project wrap-up. I peeled back the covering ever so slightly on the nose side of the repair to slip the new covering under it. This would help to prevent "peel-back" later on.



6 The portion of the yellow trim sticker I had removed earlier was torn by the break, but it flattened out nicely when I reapplied it and carefully sealed the edge with thin CA. I have to say that I'm pretty pleased with the results. If you look closely, you'll see the tear in the yellow trim sticker around the "L." You'll also see the doublers under the covering, but this is an everyday fun-flyer and not a scale show queen! All that was left to do was to put the parts back on and go fly.

The entire repair project took only a few hours over a few days. The plane performs as well as it did before with maybe an ounce of added weight just behind the CG. All in all, I am really pleased with the decision to rebuild.

This approach can also be used to repair other broken airplane parts. Just remember to check the alignment and ensure that the repair is at least as strong as or stronger than the original parts without adding too much weight.

Install a gas engine

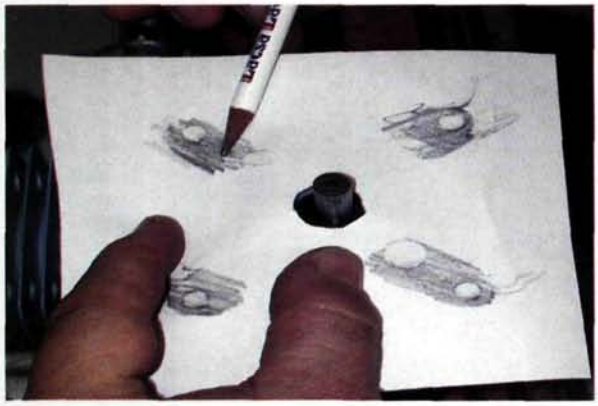
10 easy steps to hang a high-octane powerplant

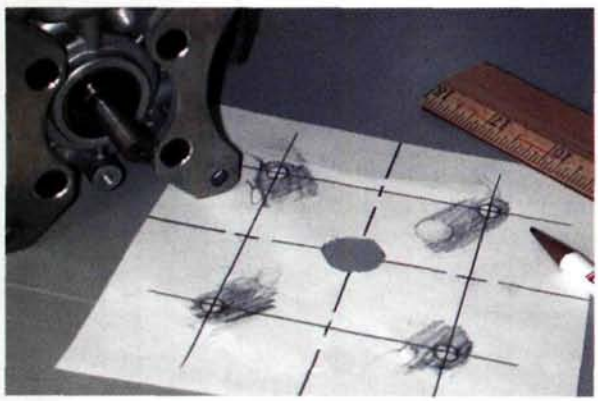
by Gerry Yarrish

When I reviewed the Great Planes S1S Pitts Special ARF for the February 2003 issue, I powered the model with a gasoline engine. You can use this method to install any type of gas engine; I used a Fuji 50cc engine turning a Menz 20x8 prop. This is a great combination, and several readers requested more detailed instructions for the installation. Here's how I did it.

Before you begin, assemble all the hardware you'll need

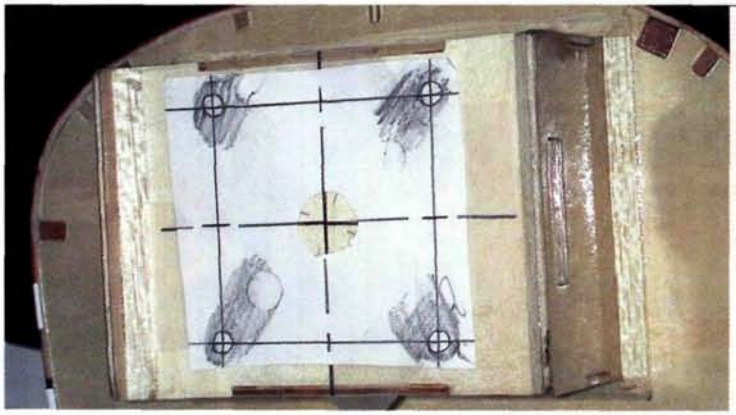
- Fuji 50cc (or 64cc) engine (with a 2-inch prop extension)
- 4, 8-32 cap-head screws, washers and blind nuts
- Ignition kill-switch
- Set of 4-40 throttle linkages (ball link, clevis and rod)
- Servo-mount attachment bracket
- 20- to 24-ounce fuel tank (with gasoline-compatible stopper)
- 24 inches of Tygon gasoline fuel tubing
- *Slimline F-1 Fueler fitting*

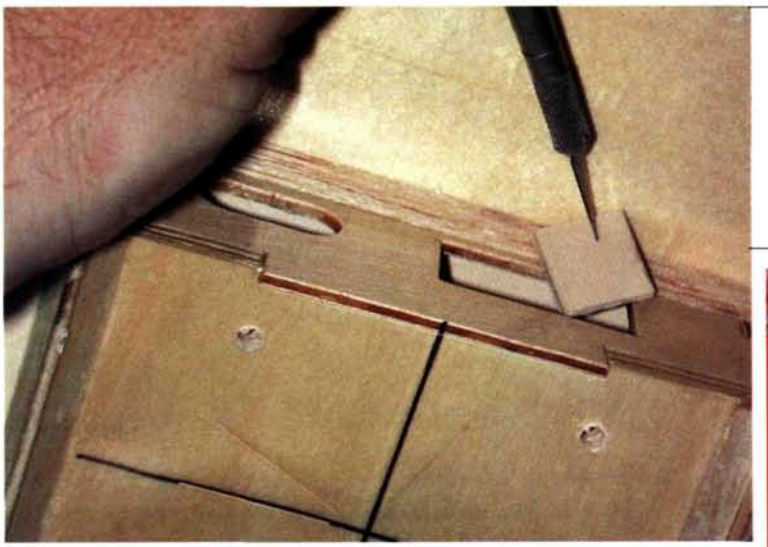




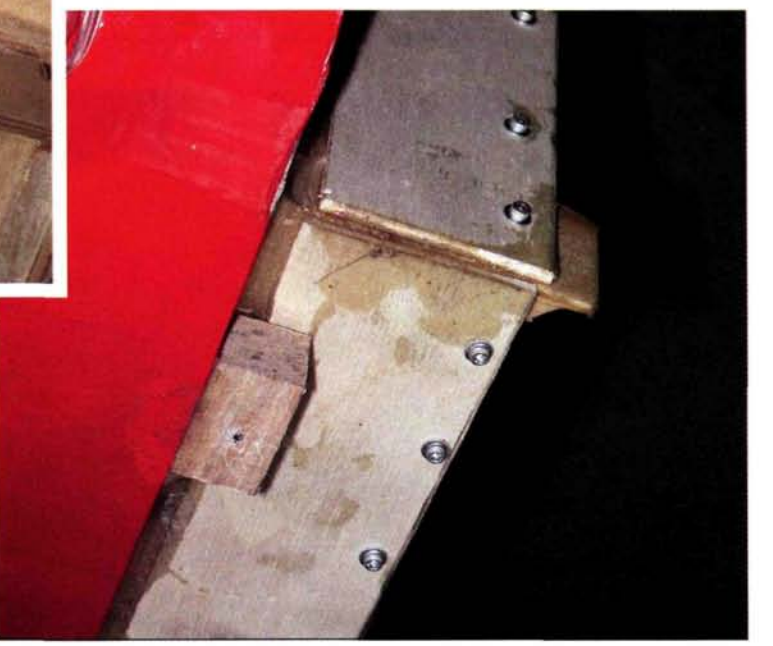
1 Before you can drill the holes in the firewall to attach your engine, you'll have to make a hole-location template to use as a guide. The easiest way to do this is to place a piece of paper over the engine's attachment bracket and rub it with a pencil to highlight the holes. Then mark the centers of the holes and draw the engine's horizontal and vertical centerlines as shown.

2 On the firewall face are reference lines stamped in the plywood. Darken the horizontal and vertical reference lines with a fine-tip marker, then tape the template over the firewall, keeping the template centerlines aligned with the firewall reference lines. Use a punch to transfer the hole positions to the firewall, and then drill pilot holes with a 1/16-inch drill bit. Note: if your engine's crankshaft end sticks out of the back of the engine case, you must drill a 1-inch hole in the center of the firewall to clear the end of the shaft.

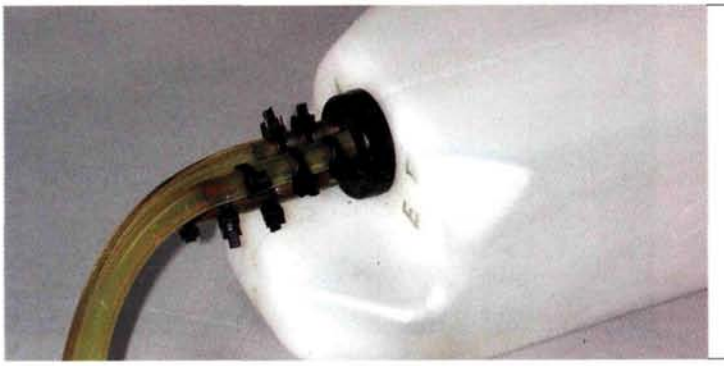




3 Enlarge the four holes with a 3/16-inch bit (for 8-32 bolts). If you plan to secure the engine attachment bolts with blind nuts, insert 1-inch squares of 1/8-inch plywood through the openings in the bottom of the box structure and glue them behind each hole, and then enlarge the holes to 1/4 inch. Pull the blind nuts into place using an 8-32 bolt and a flat washer.

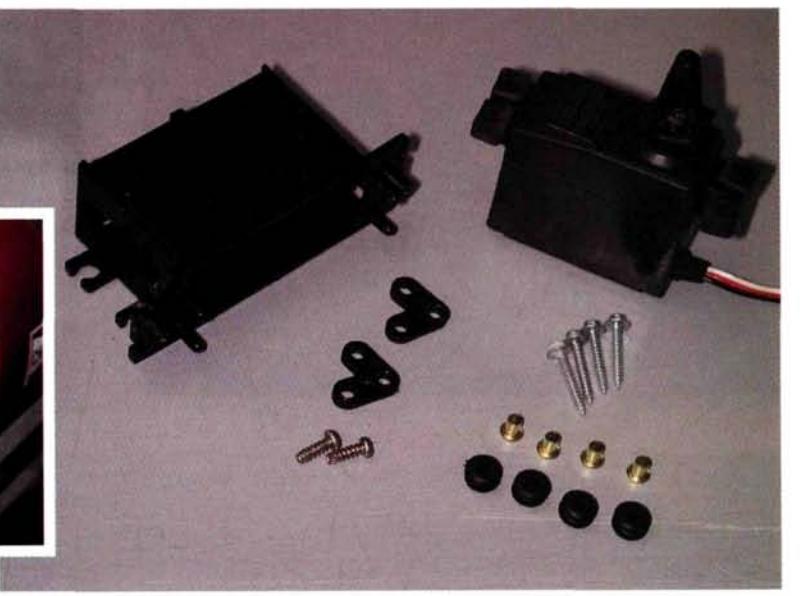


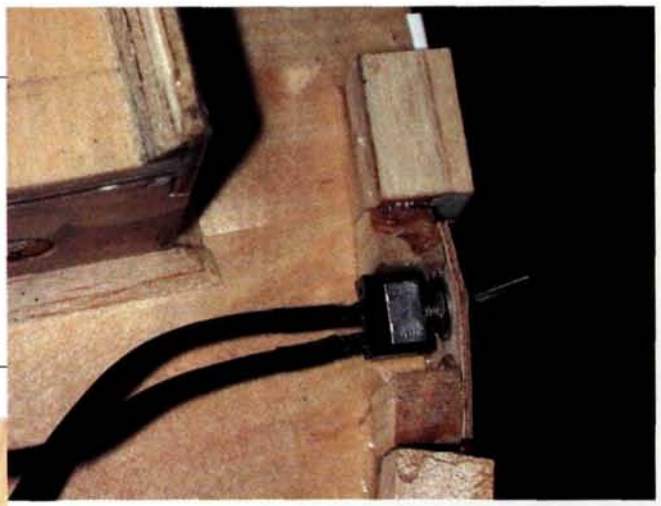
4 Since a gas engine is heavier and can produce more vibration than a glow engine, it is a good idea to reinforce the box structure around the firewall. Check all the glue joints and reglue where necessary. I added a second layer of 1/8-inch plywood (epoxied) around the box structure and then installed screws to lock the firewall into place. You could also drill holes and epoxy 1/8-inch dowels into the firewall.



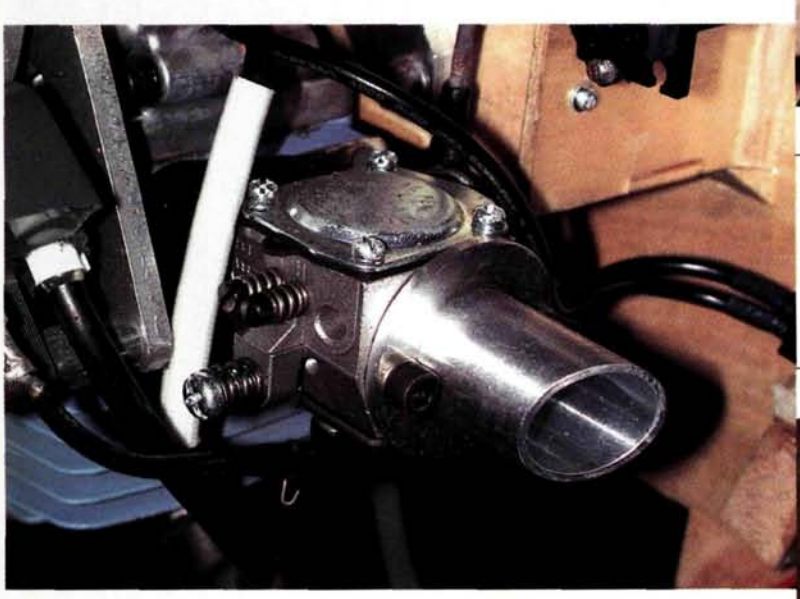
5 Now is a good time to assemble and install your fuel tank. Be sure to use a gasoline-compatible stopper and gasoline fuel tubing to make the fuel system. Note that I used several cable ties to secure the fuel tubing to the tank. You can use either a 3-line setup (with a separate filler line), or you can install a T-fitting in the tank's supply line. Either way works very well. I used the 3-line setup. Be sure to install your tank so you will be able to remove it easily for repair or service. I used a Slimline F1 Fueler fitting secured to the engine cowl to seal and support the filler line.

6 To make the throttle linkage as simple as it can be, I installed the throttle servo using a Futaba attachment box screwed directly to the side of the firewall box structure. It has grommet-isolated mounting tabs that minimize vibration. I made the throttle linkage by connecting the servo directly to the throttle arm using a 4-40 threaded rod, a Rocket City ball link and a solder clevis. After many flights, this setup remains trouble-free. You could also make a plywood servo mount and epoxy it to the side of the box, or you could cut a square opening in the side of the structure and attach the servo directly to the box. It's up to you.



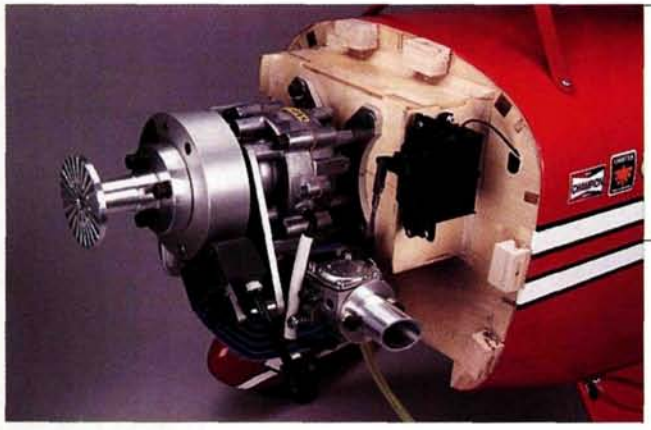


7 Bolt the engine into place using the four 8-32 cap-head bolts, and then install the kill switch. Attach one lead to the magneto and the other lead to one of the engine-case bolts. I installed the switch with a plywood bracket that I glued to the fuselage between two of the cowl-attachment blocks. I then cut a slot in the cowl so the toggle could pass through it. This allows me to remove the cowl without having to disconnect the kill switch.



8 To make starting the engine easier, I removed the stock choke plate and replaced it with a velocity stack. The stack sticks out of the side of the cowl, and I can choke the engine simply by sticking my finger into the velocity stack and turning the prop over a few times. Several stacks are available; I used a Zenoah G-23 unit.

9 The stock Fuji muffler fits nicely within the engine cowl, but you may have to remove some of the corner reinforcement on the right side of the firewall for it to clear the muffler. The stock exhaust pipe is just a little too short, so I slipped an aluminum extension tube over it and secured it with high-temperature sealant and a small sheet-metal screw. Allow the sealant to cure for 24 hours before you run your engine.



10 That's just about it! All that's left to do is to cut out the openings in the engine cowl and fit it into place, attach the propeller and spinner and fuel up the tank! The distance from the firewall to the back of the prop thrust washer should be 6½ inches. The engine fits perfectly with the Fuji 2-inch prop extension available from Great Planes. The total time to install the engine was about 3 hours—with a short break now and then for a cold soft drink!

The Fuji 50 engine is a perfect match for the Great Planes ⅓-scale Pitts Special ARF. The conversion from glow to gas power is a lot easier to do than you think. Give it a shot and see for yourself!

Desert Aircraft *(520) 722-0607; desertaircraft.com.*
Fuji Engines; *distributed by Great Planes; fujiengines.com.*
Futaba; *distributed by Great Planes; futaba-rc.com.*
Great Planes Model Distributors *(217) 398-6300; (800) 682-8948; greatplanes.com.*
Menz Props; *distributed by Desert Aircraft.*
Rocket City R/C Specialties *(205) 539-8358.*
Slimline Mfg. *(480) 967-5053; slimlineproducts.com.*
Zenoah; *distributed by Horizon Hobby (800) 338-4639; horizonhobby.com.*

Goodbye, glow: convert to electric

Welcome to the inaugural edition of a series of columns dedicated to big electric models. Of course, the adjective "big" may not always refer to the size of a model; it could also refer to the cell count, quality, motor size and speed. We'll look at both scale and sport planes; they can be built from kits, come almost ready to fly (ARF) or be built from scratch. I hope the lessons, conversion techniques and how to's in these columns will add to your body of knowledge and help you make decisions about future conversions.

Of course, before we get to any of that, it's important to have a basic understanding of electrics. This month, we'll take a look at a simple conversion of the Ford Flivver ARF kit from Dymond Modelsports. To fully understand the conversion process and decide how well a model will lend itself to the project, we must first take several factors into consideration—all of which will help determine the model's exact power requirements. Because it's a bit heavier than some other ARFs and the moments make it less forgiving of error, the Flivver isn't the most suitable candidate for conversion, but that's why I chose it. This will help show that almost any plane can be successfully converted to electric. To make things easy, we won't change anything except the motor mount.

When you plan a conversion, the weight and the wing loading should be the first things taken into consideration. (Wing loading is the total weight in ounces divided by the wing area in square feet.) Because the wing loading on the glow-powered version of the Flivver is minimal, it's a good candidate for a successful conversion. It's safe to assume that an electric motor with a speed control will weigh approximately the same as the glow engine, so our battery load will be our only significant added weight.

When it comes to wing loading, lighter is always better. Higher wing loadings will negatively affect takeoff speed, stall and the power the model needs to perform to our expectations. For aerobatic sport planes and warbirds, a wing loading of 20 to 25 ounces is acceptable, and in the case of some scale planes, it can run even higher. If I can keep the Flivver's weight between 6 and 7 pounds, it will have a wing loading of 24.8 ounces per square foot (112 ounces divided by 4.5 square feet)—perfect!

Various formulas exist to determine how much power a model requires; the most popular indicates a model needs 30 watts per pound for level flight, 50 to 60 watts per pound for mild aerobatics and 70 to 100 watts per pound for demanding aerobatic maneuvers. (See the "Watt's Up?" sidebar to learn how to determine how many watts a particular setup will produce.) Because I want the Flivver to be at least mildly aerobatic, the motor system I choose must supply a minimum of 50 watts per pound.

When I decide that a model is a good prospect for conversion, I compile a list of possible power setups. When choosing a power system for a conversion, I rely mainly on my experience. For example, because I know that models comparable to the Flivver have been successfully flown with an AstroFlight 15G motor on 14 cells, I can assume that it is suitable for this project. In addition to the AstroFlight combination, I also decided to experiment with two other power systems: a Kyosho Endoplasma motor with Inner Demon gear drive and a MaxCim Max15-13Y motor—each on 20 cells. The Kyosho Endoplasma setup is a dual-motor setup wired in a modified series circuit developed by Model Electronics Corp. (MEC)

SPECIFICATIONS

MODEL: Ford Flivver
MANUFACTURER: Dymond Modelsports
TYPE: sport-scale ARF
WINGSPAN: 54 in.
WING AREA: 648 sq. in.
WEIGHT: 78 oz. (.40-size engine)
WING LOADING: 17.3 oz./sq. ft.
PRICE: $149

BY THE NUMBERS

Following is an excerpt from the ElectriCalc projections for the three motor systems I tested for the Flivver: (Note: this chart depicts full-throttle operation.)

	MAXCIM MAX15-13Y	KYOSHO ENDOPLASMA	ASTROFLIGHT 15G
WEIGHT (oz.)	120	131	107
WING LOADING (oz./sq. ft.)	26.7	29.1	23.8
PROP	APC-E 15x10	APC-E 17x10	13x8
KPROP RPM	6.34	4.35	6.96
MOTOR AMPS	41.6	54.3	36.5
MOTOR WATTS	793	472	499
CRUISE MIN.	9.5	8	8
WATTS/POUND	106	115	75
CELL TYPE	CP-2400SCR	CP-2400SCR	CP-2400SCR
CELL COUNT	20	20	14

This is just a sampling of the information provided by the ElectriCalc program. (For a complete list of calculations, take the click trip.) Right off the bat, we can see that using the MaxCim motor with 20 cells brings the weight up to 120 ounces (7.5 pounds). Using the watts per pound formula (60 watts per pound for a mildly aerobatic model), we know that the Flivver requires a motor that produces at least 450 watts. So, all three systems in this scenario would provide adequate power. There are many other factors to consider as you become more exact in the assessment of your project, but this will get you started.

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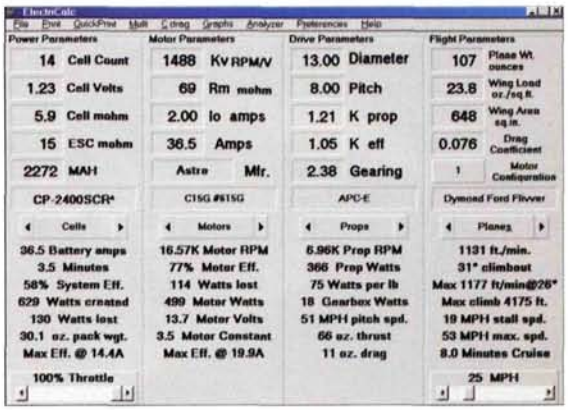
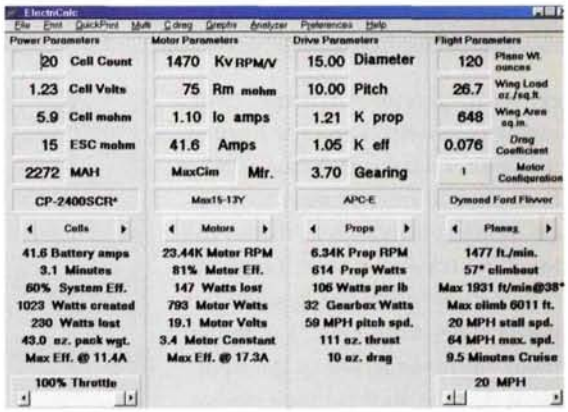
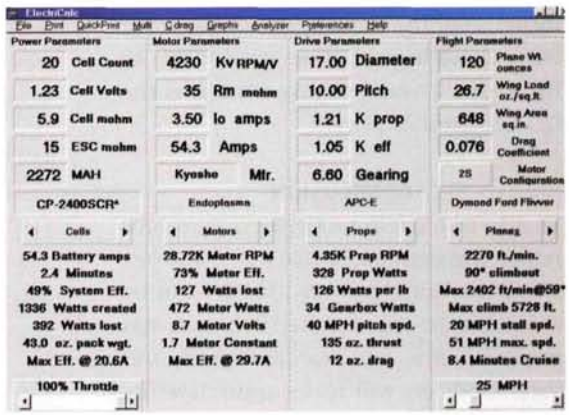


ElectriCalc projection for AstroFlight 15G setup on 14 cells at full throttle during takeoff speed.



ElectriCalc projection for MaxCim Max15-13Y geared 3.7:1 setup on 20 cells at full throttle during takeoff speed.



ElectriCalc projection for Inner Demon geared 6.6:1 ratio with two Kyosho Endoplasma motors setup on 20 cells at full throttle during takeoff speed.

that drives a single prop through an Inner Demon gearbox manufactured by Model Machining Services. The most important thing to remember about this setup is that the current, as listed, is about 54 amps, but each motor receives only half that.

The selection of motor systems is not an exact science; years of experience and a substantial knowledge of the subject contributed to my selection of the latter two systems. Much of this process will be trial and error for those who have less experience.

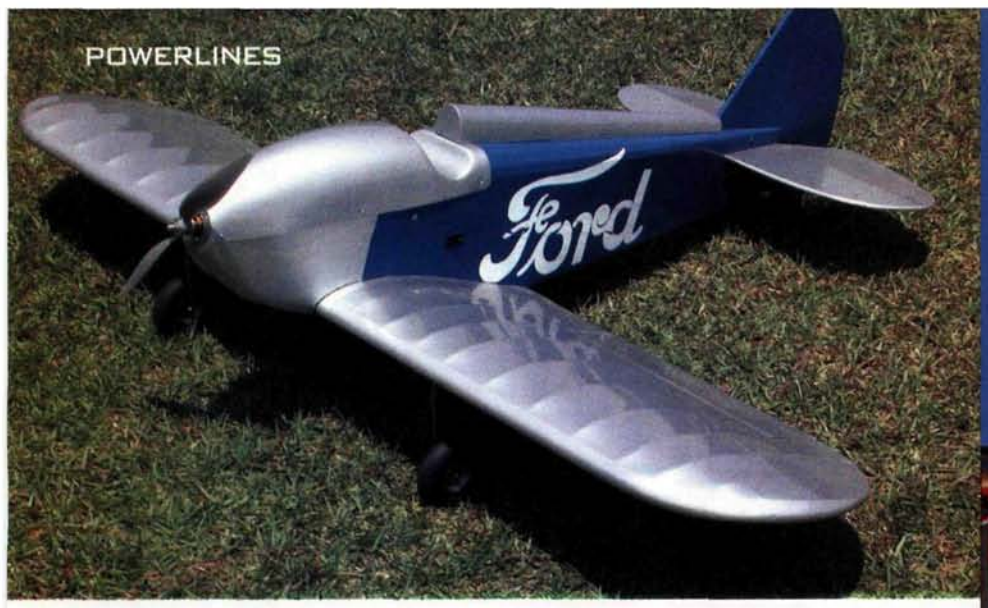
After I choose an appropriate model for conversion and some possible power systems, I enter the data in a simulation program such as ElectriCalc or MotoCalc. In this case, I entered the battery type, the number of cells I chose, the weight of the airplane, the wing area and the selected motors. The computer program does the math for you and provides all the numbers necessary for you to decide which system will prove most successful. (See the "By the Numbers" sidebar.) Such programs also feature databases full of possible motor/cell combinations for beginners to choose from that will help eliminate some of the trial and error process. Do yourself a favor and invest the $30 or so in one of these programs. It's well worth it!

I've flown the Flivver with all three motor setups, and although each one works well, my favorite is the MaxCim motor on 20 cells. It is the most efficient of the three and produces a better power-to-weight ratio. The MaxCim's versatility is perfect for larger airplanes.

When I have chosen a motor, I can tune the system further by varying prop sizes in the simulation program. There is plenty of room in the Flivver to move batteries fore and aft to adjust the

POWER 101

To calculate the number of watts a particular setup will produce, just multiply volts by amps. A Ni-Cd cell puts out 1 volt per cell under load, i.e., with the motor running, and an amp is a measure of the current drawn by the load. In the case of the AstroFlight 15G motor with most sub-C-size Ni-Cd cells, the power system can safely draw 30 amps without damaging the motor. If we want the 7-pound Flivver to be capable of mild aerobatics, the motor system must produce 50 to 60 watts per pound. So, if we multiply the weight of the plane by the watts per pound our model requires, we get the number of watts we need our power system to produce (7x60=420). Then, if we divide the watts we need by the amps we know can be safely drawn, we get the number of volts required (420/30=14). Because one cell equals one volt, we know we need 14 cells to produce 420 watts at 30 amps and 60 watts per pound for this 7-pound airplane. It's as simple as that! All three experimental power systems I tested on the Flivver met these requirements.



center of gravity (CG); this helps when you switch from a heavier dual-motor setup such as the Kyosho Endoplasma/Inner Demon to a single motor system such as that of the MaxCim. For each system, I built my own battery packs using solderless power tubes from MEC. I mounted them on the underside of the equipment deck, as shown in the photos. With the Flivver's short nose, it's very easy to end up tail-heavy. The recommended CG range is 4 to 4.5 inches from the leading edge of the wing, but I found it much more comfortable to fly at the 3.7-inch setting. This puts the CG at around 30 percent.

Thanks to modern technology, numerous motor systems are available today, and just about any glow-powered model can be converted to electric.

CONCLUSION

Thanks to modern technology, numerous motor systems are available today, and just about any glow-powered model can be converted to electric. Electric power has many benefits. It's clean and quiet, and scale modelers will really appreciate the lack of vibration as well as the variety of materials available that don't need to be fuelproofed. Stick around; you may be an electrics enthusiast before you know it!

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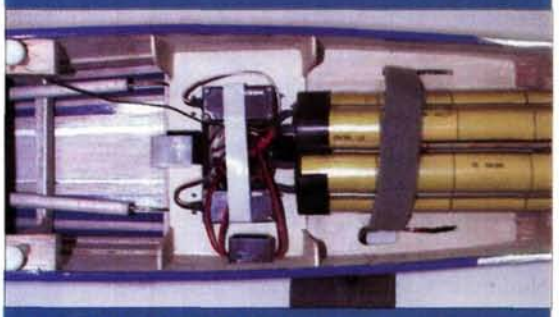
THE NUTS AND BOLTS

The conversion itself is actually very easy. I cut the plywood engine mount out of the nose of the Flivver and bolted the new motor mounts to the firewall. I also cut a slot in the equipment tray above the motor batteries to allow for the hook-and-loop fastener strap that will hold the power packs in place. To access the batteries, I have only to remove the wing. That's it! Conversions don't get much easier than this. The Flivver flies well with each setup, and it has become a virtual test bed for motor systems.

This is the installed MaxCim brushless system. I used a standard SonicTronics universal mount and employed a hose clamp to secure the motor. The original MaxCim mount could also be used, but it would require a spacer box to move the motor far enough forward to extend through the nose ring.

A second firewall mount allowed the Inner Demon gearbox setup to fit nicely in the nose of the Flivver. The mounting nuts fit behind the spacer, and the second firewall is simply bolted to the blind nuts that held the MaxCim setup. The two setups can be switched in a matter of 15 minutes, allowing me to easily test various prop and cell combinations.



With the wing removed, you can see the MEC solderless power tubes held in place by hook-and-loop fastener. They are slid through the firewall and rest under the motor. The MaxCim and the Kyosho setups are each powered by 20 Sanyo CP-2400SCR cells.

by Charlee Smith

Heavy metal: scale surface secret

If you enjoy building scale replicas of heavy iron WW II aircraft, you know how important and satisfying it is to precisely simulate the metal structure of the full-size warbird. The least difficult method of simulating the metal surface is to draw panel lines and hatches onto the finished surface of the aircraft with a fine-line ink pen. This produces a very striking effect for stand-off scale competitions. And if the full-size aircraft was manufactured entirely with butt-jointed, aluminum panels, this method is adequate for all competitions. Most older metal aircraft, however, were constructed of overlapping aluminum panels. This results in an additional dimension that drawn lines can't duplicate.

The established method of simulating raised panels is to first prepare the model's outer surface with fiberglass, epoxy or polyester finishing resin and primer to the point where it is almost ready for paint. The panel lines are then drawn with a soft pencil and masking tape (one layer for smaller scales and two layers for 1/6-scale or larger) is placed along these lines. Several coats of primer are then sprayed or brushed on to build up to the thickness of the edge of the tape. The primer is then sanded completely off the tape and blended into the rest of the surface. When the tape is finally removed, it leaves a raised panel.

I've experienced two problems with this method: the primer is heavy, and it sands down too easily. During the final sanding before painting, the panels' sharp edges were too easily lost. While building my PBJ, I came across a product that every serious modeler needs—Poly-Fiber Super-Fil distributed by F&M Enterprises. This ultra-lightweight epoxy putty is ideal for many modeling applications, including simulating overlapping panels. It is easily sanded and is surprisingly strong, even in thin layers.

GETTING STARTED

I prepare the model's fiberglass surface by spraying it with auto-body filler and primer, which is available at most auto-parts stores. It's compatible with most paints and (most important to me) is very easy to use. In the complete finishing process, many times only a small area needs to be covered

I use Hobby Poxy's Stuff to fill any imperfections left visible by the primer. When dry, it should be sanded flush with the fiberglass surface as seen here.

with primer. Setting up and cleaning a spray gun is one of my least favorite aspects of modeling, so a spray can that works just as well is invaluable.

The Super-Fil must be applied evenly to both sides of the 1/64-inch tape and blended smooth with the model's surface.

The primer coat will show all the imperfections that need to be filled, such as pinholes, low spots and voids. I apply Hobby Poxy's Stuff with a flat toothpick for this. Because Stuff shrinks a little, it's a good idea to apply more than seems necessary. Depending on the size of the void, it will dry in 30 minutes to three hours.

MASKING IT OFF

Sand down all surfaces until the primer is virtually gone. Then draw the panel lines and apply the masking tape. If the aircraft has butt-jointed panels, I apply 1/64-inch drafting tape along the line, but this can be difficult to work with. Hold down one end of the tape at a starting point, and stretch it tight above the drawn line. Hold the tape slightly beyond the length needed to reach its eventual endpoint, and lay it down in one motion, concentrating on hitting the endpoint of the line. If you miss, pull it up and try again, but remember to keep the tape taut. When it is in the correct position, press it down firmly against the surface. If you lay down the tape just a couple of inches at a time, you'll find it very difficult to keep it straight.

When the masking tape is removed, the Super-Fil creates the panel lines that are clearly visible here.

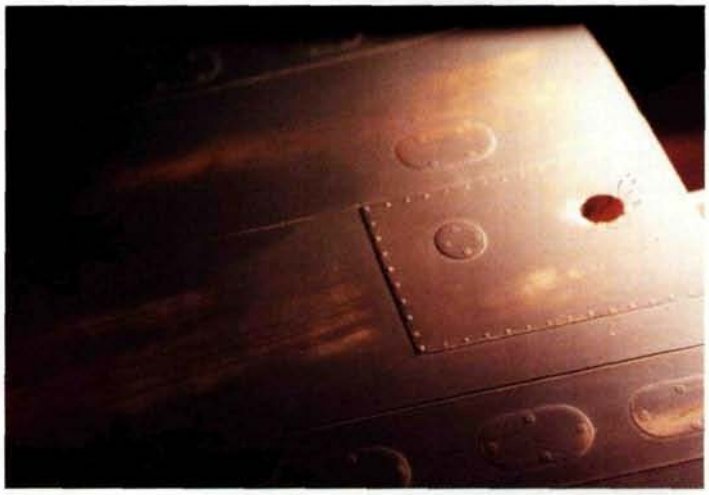
At the junction of multiple raised panels, the masking tape must be applied differently. The ends must be cut at an approximate 35-degree angle, and some sections of the tape should be angled at both ends. Angle one end, then apply the tape to the model, and cut the other end while on the surface using a no. 11 hobby blade. When the tape has to form clean 90-degree corners, use a straightedge and a knife to cut the end of the tape perfectly square. I've never been able to do this consistently with scissors. In some areas, it may be easier to form one completely sanded panel and then come back to form another that adjoins it.

FILL IT UP

At this point, I apply the Super-Fil to the surface in sections. Never mix more than 9 grams together at any one time. The components must be mixed at a 2:1 weight ratio, so some type of scale is useful here. I use a Popsicle stick to thoroughly mix the Super-Fil on the plastic lid of a coffee can. This forms a reusable mixing surface that can be flexed to remove unused, cured putty and epoxy. With the Popsicle stick apply the Super-Fil to the edges of the tape, and blend it into the model's surface over about 3/4-inch-wide area. The initial application doesn't have to be perfect. After about half an hour, smooth out the Super-Fil even further by dipping your finger in water and rubbing it over the surface. Carefully blend the areas around the angled pieces of tape so that the Super-Fil doesn't reach the tape's angled edge except at its point. Blend Super-Fil into each side of the 1/64-inch tape.

TAKE IT ALL OFF!

After six to eight hours, use a hard-backed sander to sand the Super-Fil down to the thickness of the masking tape. I carefully blend the Super-Fil into the model's surface by using a combination of a sanding block and the sanding sticks used by manicurists. The ends of the sanding sticks can be cut into any shape needed to blend the areas where the raised panels meet.

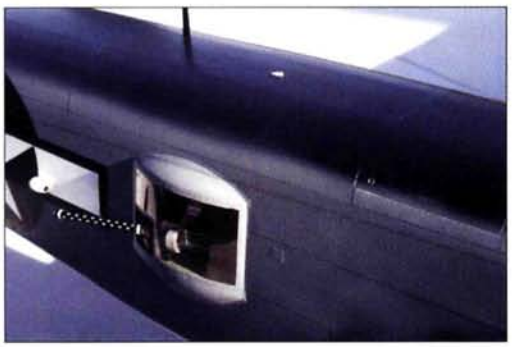


Self-adhesive Mylar sheets are excellent for duplicating raised inspection panels.

The next step is to remove the masking tape. Don't expect every edge to be perfect. Some small slivers of the tape may stay attached to the surface, and sometimes the texture of the tape will leave a slightly rough edge. Both these problems can be solved using the blade of a fine-tooth razor saw. You will find this to be one of your most useful tools. It's a necessity for cutting out hatches and doors in scale aircraft. In this case, the blade can be run along the edge of the raised panels to make them virtually perfect.

Removing the 1/64-inch tape is not as easy. Many times, only the thin Mylar that forms the outer surface of the tape will peel away from the recessed panel line. The groove remains filled with adhesive from the tape. I have found that running the backside of a dull no. 11 blade through the groove removes most of this. Any residue left can be removed with a paper towel soaked in Bob Smith Industries Insta-Set CA accelerator. This will remove adhesive residue without damaging the underlying surface.

The last step is to spray the raised panels with primer. The only disadvantage of Super-Fil is its tendency, at times, to form pinholes. I used Stuff to fill these, then I sanded down the primer, applied another coat and repeated the process. The aircraft is now ready for the standard final preparations for painting (more primer and sanding). Any excess primer that builds up along the panel edges can be removed with the razor saw.



As you can see here, all that extra time and effort are well worth it!

FINAL NOTES

Some smaller panels and inspection hatches are best duplicated on non-compound surfaces with 1mm and 2mm-thick self-adhesive Mylar sheet. Shapes can be cut out and applied very easily. Once on the model's surface, the Mylar can be lightly wet-sanded with 600-grit sandpaper. This knocks down the sharp edges of the panels created when they are cut out with scissors or a knife and makes them more realistic-looking. The aircraft is now ready for rivets, but that's a whole other story—one we'll explore next time. ✈

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SLIMLINE MFG.

Showtime Smoke Pump

Programmable flow for more smoke

For years, giant-scale modelers have pumped all sorts of substances into hot mufflers to produce puffy white trails of smoke. With varied degrees of success, they have used everything from engine-crankcase pressure to high-output electrical fuel pumps to inject the magic juice into the hot confines of an exhaust system. Now, after several years of R&D, Slimline has developed a totally self-contained unit that eliminates any guesswork from converting smoke fluid into impressive smoke trails!

The Showtime smoke-pump system comes with all the plumbing you'll need to connect it to the muffler: 15 inches of high-temperature Nitril tubing, 15 inches each of large- and small-diameter Tygon tubing, a high-flow filter, a medium-to-large tubing adapter, two Slimline F1 intake fittings with caps, an F1 fill nozzle, a small T-fitting and an F1 check valve. Measuring 3⅝x2x1¼ inches, the unit is in a vented, anodized-aluminum case that contains its own 6V 600mAh NiMH battery pack. Two factory-installed 8-32 thumbscrews secure the unit.

The pump can be used with programmable and standard, non-programmable radio systems. For standard radios, simply plug the unit into an auxiliary channel (such as the one for the retractable landing gear). Turn the pump on briefly to test that it operates properly. The pump controller has a safety feature that requires the pump to be sent an off signal for 5 seconds before it turns on. This ensures that the pump won't accidentally be activated if the receiver is switched on before the transmitter is.

If you have a programmable radio, you can set up the Showtime Smoke Pump for fixed- or variable-speed flow. Adjust your radio's servo-travel adjustment (ATV) for 90 percent, and test the system. You can then adjust the flow by increasing or decreasing the ATV percentage until you get the most smoke with the least smoke fluid. You can also "slave" your smoke channel to the throttle channel and adjust the point at which the smoke channel turns on relative to throttle-stick position. This is a good way to prevent smoke from entering the muffler when the engine is at or below ¼ throttle, as that could cause the engine to quit.

With a street price of $159.99, the Showtime Smoke Pump (item no. 2015) offers precise control that has never before been available for making smoke trails. Go ahead and get one; your aerobatic model will love you for it! —*Gerry Yarrish*

Slimline Mfg. (480) 967-5053; slimlineproducts.com.

SKS/PROPWASH VIDEO PRODUCTIONS

Joe Nall 2003

"100 years of Flight"

The 2003 Joe Nall "100 years of Flight" video by SKS/Propwash Video Productions is action-packed and will bring the Triple Tree Aerodrome right into your living room. From early morning until nightfall, the Joe Nall Fly-In is the "Oshkosh" of radio control. This year's event saw 540 registered pilots and more than 600 giant-scale masterpieces committing aviation on a grand scale. As is the norm for Joe Nall, the video showcases every kind of RC giant you can think of—from a scratch-built, 170-inch Avro Lancaster powered by four Zenoah G-23s to a very aerobatic turbine-powered Eurofighter jet; there's never a break in the action.

Narrated by Werner Kopp and Scott Stauffer, there are plenty of close-up details, flight action and interviews. In addition to the modeling activities, there is really awesome footage of three full-size airshow demonstrations! Aerobatic flights were flown by Matt Chapman in his CAP 232, Mike Mancuso in his Extra 300 and a formation aerobatic demo by four North American AT-6 Texans. With a run time of 110 minutes, this video brings you as close to being at the famous Joe Nall Giant Scale Fly-In as you can get without hopping on an airliner bound for Greenville, SC. Price is $19.95 (plus S&H). This tape is a keeper for sure! —*Gerry Yarrish*

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It's becoming quite clear that we may never completely stump you, but we take some solace in coming damn close. Such is the case with August's mystery plane. Congratulations to Dani Ancona of Tel Aviv, Israel, who was one of only three—that's right, three—readers to correctly identify the aircraft as the Kaiser Hammond, a postwar version of the Stearman Hammond Y (from which it took its basic design).

The Kaiser Hammond was a twin-tail, pusher-type aircraft that featured dual controls, had no rudder and was reported to be spin and stall proof. Production versions of the aircraft were to feature retractable landing gear and be of all-metal construction, but unfortunately, the Kaiser Hammond never made it past the fabric-covered-wing experimental stage shown here.

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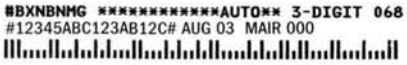

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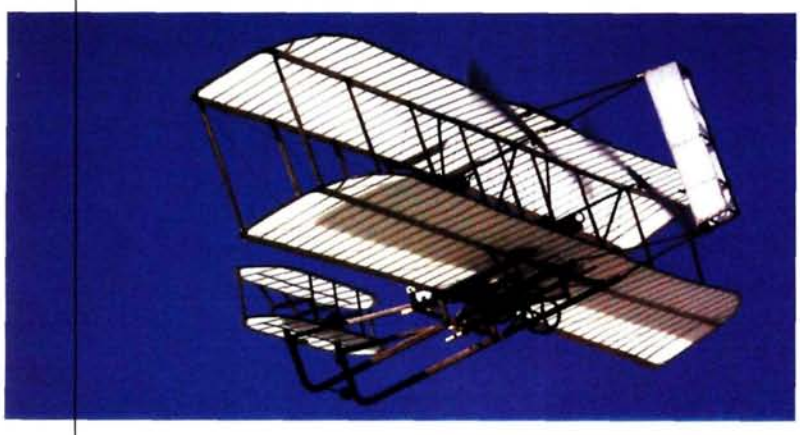
BY ANDY CLANCY

FINAL **APPROACH**

Flying tribute to aviation pioneers

The 1903 Wright Flyer is a very attractive subject to model—not only because it is the famous first flyer but also because everything about it captures the imagination. Its sateen-covered wings conjure up images of sailing ships and adventure. The motor and controls are simple and elegant, especially compared with the likes of, say, an F-15. What modeler hasn't imagined himself in Wilbur's and Orville's perch, floating high above the sand dunes? The Wright Flyer is more than a milestone; it's an intriguingly beautiful machine and a tribute to the tireless efforts of the pioneers who turned the dream of flight into a reality.



But as appealing a model as the Wright Flyer is, its design is not the most conducive to flight. Not only did I want to pay homage to this extraordinary machine, but I wanted to take on the tremendous challenge of building and flying a model of an aircraft that barely flew in real life as well. After all, it was the very first plane. Some of its features—such as counter-rotating props, anhedral wings (the wing bends down at the tips, instead of up), interlinked wing warping and rudder control—were far from what we now consider standard. Though it made the project more difficult, I really wanted to duplicate as many of these features as I possibly could.

One of the biggest problems was that the Wright brothers deliberately designed their aircraft to be unstable. They planned to test-fly it on a very windy beach, and an unstable plane is less sensitive to wind and is more maneuverable. Perhaps inspired by seagulls, they discovered that anhedral helps prevent wind gusts from lifting a wing.

That the Wright Flyer was extremely tail-heavy also contributed to its instability. To counteract the tail-heavy design, I tried to keep the plane as light as possible. Aft of the balance point, I tried to save weight wherever I could. I used tissue paper to cover the model and even made props out of plywood. (Because the props were in the rear of the plane, they could be much flimsier than is normally acceptable.) With each prototype, I decreased the diameter of the wing struts, and I mounted anything heavy as far forward as possible. The battery is placed as far forward as possible yet is still hidden. (It's in the pilot's chest!)

Since this model combined many unique features, crash-survivability became extremely important, just as it was to Orville and Wilbur. Indeed, the entire front of the original Wright Flyer worked like a giant shock absorber. On my model, rubber bands served that purpose; I used them to mount everything outside of the wing truss. Keeping the plane light not only helped with stability, but it helped to minimize crash damage, too.

I was extremely eager to take on the challenge of incorporating counter-rotating props in my model. Counter-rotating props are not commercially available, so in the spirit of the Wright Brothers, who built even their engine from scratch, I set to work making my own counter-rotating props. Ultimately, these props contributed much more than scale realism to the project. The rudder was ineffective at counteracting the torque caused by two propellers spinning in the same direction. The counter-rotating props actually prevented the plane from pulling hard to the left.

On the original Wright Flyer, a single motor turned both props, but this was one challenge that I declined to accept. Though it would have been fun, such a setup would have been cumbersome. Instead, on my Wright Flyer, a single motor turns each prop.

In the end, the difficulty involved with the design and construction of this model made flying it even more rewarding. Its many unique features made the test flights very exciting. Following several mishaps, I was at last able to complete a successful flight, and at that moment, it was a little easier for this Wright Brothers fan to imagine the pure joy they must have felt on that historic day 100 years ago. ✈